Concrete

Vol. 34 Chicago, February, 1929 No. 2

Structural Concrete in 1928

A Review of Developments in the Field of Reinforced Concrete During the Past Year—Increase in Use of Quality Controlled Concrete—Building Code Revisions Stimulate Improvements in Construction Methods—Light-weight Aggregates—Some Outstanding Structures Completed During the Year

PROGRESS in the use of structural concrete in 1928 might well be described as a process of "digging in," for the purpose of consolidating the positions gained. Some outstanding structures have appeared during the year, and yet the real accomplishment is the further increase in our common fund of knowledge about cement and concrete.

Water-Cement Ratio Control

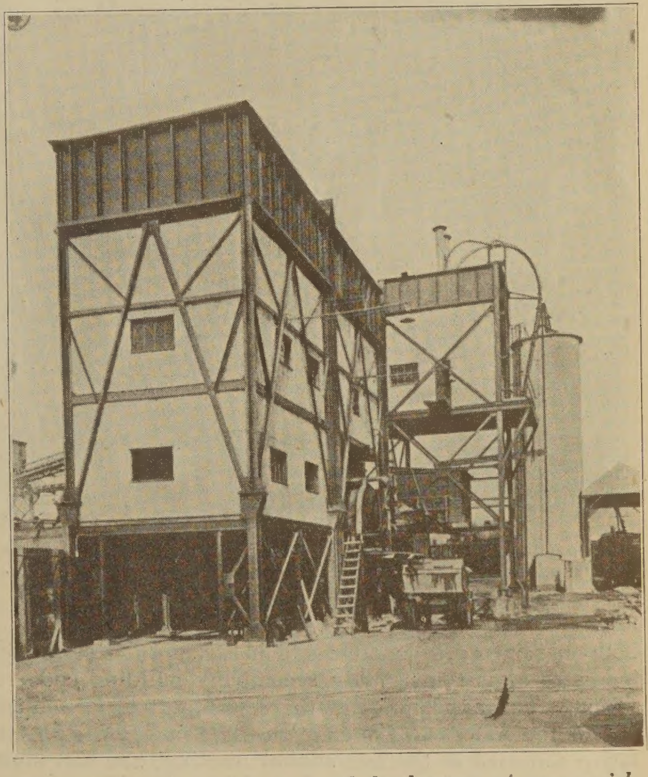
In no direction has the "digging in" process been more in evidence than in the increased recognition of both the truth and the practicability of the water-cement ratio method of controlling the strength of concrete. Engineers and architects who follow this method of dealing with concrete are certainly in the majority, if one confines the count of noses to the successful men in these professions. Contractors are learning, one by one, that proper attention to the control of the water-cement ratio results in an actual saving in cost, plus better concrete and a better reputation as a builder.

Recognition in building codes has exerted a substantial influence in the spread of the gospel of better concrete. No less than 24 city building codes now base the assumed strength of concrete on the water-cement ratio, and other cities permit the use of correspondingly higher working stresses in higher-strength concrete. In one city alone the adoption of a new building code which incorporated the water-cement ratio resulted in the complete conversion of the two leading general contractors of the city, who formerly scoffed at the idea as pure theory. While the conversion originally came about through compulsion, because of the code requirements, these contractors are now among the enthusiasts of the water-cement ratio school.

Project after project is reported as being constructed under water-cement ratio control, and a gratifying number of such reports deal with comparatively small structures.

Design

A noteworthy advance in the design of reinforced concrete is represented by the appearance of Arthur R. Lord's "Handbook of Reinforced Concrete Building Design," the first issue of which was published in September by the Portland Cement Association, the Rail Steel Bar Association and the Concrete Reinforcing Steel Institute. The handbook is a somewhat enlarged edition of the paper presented by the author before the annual meeting of the American Concrete Institute. The short-cuts in design, made possible by the convenient charts and tables, far exceed the ground covered by previous books on the subject. In addition, the handbook contains the American



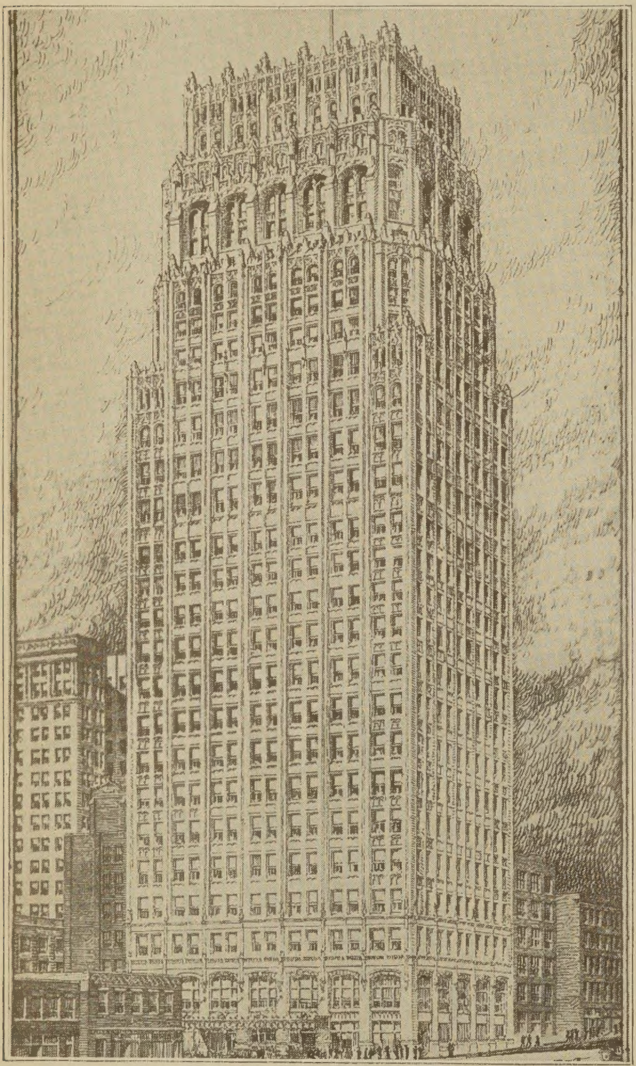
The past year has seen the rapid development of commercial central mixing plants. Continued activity in this direction may be expected during 1929

Concrete Institute's well-known tentative standard on the subject of "Building Regulations for Reinforced Concrete."

Another contribution to the subject of design is the series of articles by Prof. James R. Griffith beginning in the March issue of CONCRETE and appearing under the title "Reinforced Concrete Design Simplified."

Building Codes

An important trend in building codes is the tendency to permit the use of higher working stresses than formerly, both in reinforced concrete and in structural steel. Such increases almost invariably accompany building code revisions. The appearance of the new report of Committee E-1 of the American Concrete Institute, adopted as a tentative standard at the last annual meeting, has had much to do with stimulating interest in higher working stresses when coupled with better supervision of design and construction.



An outstanding 1928 *example of the use of haydite in the* 14-*story addition to the existing* 14-*story Southwestern Bell Telephone Building at Kansas City*

The Department of Commerce Building Code Committee issued a new report during the year, in tentative form, on the subject of "Minimum Requirements for Fire-Resistance in Buildings." While the report is in tentative form it is not to be quoted; but so far as concrete is concerned we are able to say that due account is being taken of the differences in the fire-resistive qualities of various kinds of coarse aggregates.

Ready-Mixed Concrete

Much interest has developed during 1928 in the subject of centrally located concrete mixing plants, equipped to deliver ready-mixed concrete to the construction site. Many such plants have been in operation for several years, so that much of the pioneering has been done. On other pages of this issue will be found a more complete study of the progress made in the establishment of central mixing plants.

Light-Weight Aggregates

The advantages of the use of light-weight aggregates in structural concrete were emphasized in several important buildings erected during the year. Among them is the upward extension of the Southwestern Bell Telephone Company Building at Kansas City, a concrete-encased steel framed building. (See CONCRETE, August, 1928.)

This building originally was designed as a 26-story structure, but only 14 stories were then built. When plans were under preparation for the addition of the 12 extra stories, it was determined that by the use of "haydite" as the fine and coarse aggregate for the concrete, 14 stories might be added. Haydite is a burned shale aggregate.

The same material was used in the Hightower Building, a reinforced concrete office building in Oklahoma City. This building was originally designed to be eight stories high, but only three stories were built. When plans were made for building the five additional stories, comparative computations proved that seven stories could be added if haydite concrete were used. This was done, as a result of which the completed building is ten stories high instead of eight.

Miscellaneous light aggregates, for both structural concrete and concrete building units, received considerable attention during the year. Among them are sawdust, slag and coke breeze.

Cinder Concrete Units as Fireproofing

Considerable publicity was given to the use of solid cinder concrete building units in the fireproofing of two large buildings in Philadelphia. One of these structures is the Integrity Trust Building, a 22-story office building, and the other is a 26-story apartment building. The cinder concrete units were used for all fireproofing of columns and other structural parts in these two buildings, and as back-up in the outside walls. While similar units of cinder concrete often had been employed for such purposes, these two instances constituted their first use in buildings of great height. (See CONCRETE, October, 1928.)

Tall Reinforced Concrete Buildings

The year 1928 has seen a new height record for reinforced concrete buildings in the United States. The new record is made by the 20-story Master Printers' Building, in New York City, which has a height of 281 ft. from the sidewalk to the top roof slab. (See CONCRETE, February, 1928.) This is about 5 ft. higher than the 21-story United Brethren Building in Dayton, Ohio, which held the record for several years. The Master Printers' Building, however, is designed for a live-load of 250 lb. per sq. ft., while the Dayton building is designed only for ordinary office floor loading.

Concrete Floors for Residences

The use of concrete floors for residential buildings has been stimulated to an unusual degree during the past year. Various types of concrete floors, including the standard floor pan type, the use of concrete masonry units in conjunction with reinforced concrete and special types of pre-fabricated reinforcing systems employing light steel structural numbers in conjunction with concrete slabs poured without forms, have been much more frequently used than in previous years.

Organizations specializing in the manufacture of such floor equipment have been active in co-operating with concretors so as to make it easier for the contractor to place floors of this type. The work has now become familiar to many house contractors and the inherent advantages of such floors will undoubtedly result in a steady increase in their construction.

Dams

In the realm of dams the year 1928 produced a terrible tragedy when, on the night of March 12th, the St. Francis dam, in California, failed and carried death and destruction down the river valley. The character of this failure and its probable causes are discussed in the April and May issues of CONCRETE. It will be sufficient to say here that the dam was the solid gravity type, curved on a radius of 500 ft. to the upstream face of the crest. The maximum section was 205 ft. high and 175 ft. thick at the base. The downstream face of the dam was carried up in a series of steps having the uniform height of five feet, but with widths varying from 5.5 ft. near the bottom, to 1.45 ft. near the top. In consequence, the downstream face was in the nature of a curve with an increasingly forward sweep as the toe of the dam was approached.

This forward sweep had the effect of greatly increasing the width of the base at the lowest point in the stream bed, giving this part of the dam a base-width equal to the width required if full upward pressure had been considered in the design. Toward the ends of the dam the base-width was considerably less than required for the resistance of full upward pressure. It was this condition, combined with the remarkable fact that a 100-ft. section in mid-stream remained standing, that gave rise to the controversy as to the adequacy of the design. While all investigators are agreed that the immediate cause of the failure was the soft foundation, some engineers contend that if the dam had been designed for full upward pressure it would have remained in position and would have served as a check to the flow of water.

Storms

Several violent hurricanes, fully equal in intensity to those of 1926, again swept some of the West Indies and Florida, in September. The loss of life was far greater than in 1926. The structural lessons taught by the hurricanes was the same as in 1926, namely, that all building materials of good quality, when reasonably well constructed, withstood the storm. Flimsy construction suffered, as it did in 1926.

Rockford, Illinois, was struck by a violent tornado on September 13th. Considerable loss of life occurred and much property was destroyed. The path of the tornado led directly through a number of factory buildings, many of which were wholly or partly destroyed. Among them stood one modern factory building, a 6-story reinforced concrete structure belonging to the Mechanics Universal Joint Co., and it remained undamaged. The factory buildings destroyed were for the most part of brick bearing-wall construction.

Celebrating 25 Years of Service

Next month—March, 1929—CONCRETE will see the completion of 25 years of service to those interested in the making of concrete in all its various forms.

Instead of staging a little birthday party, and asking the industry to bring us presents and pay for the cake, we are planning to publish for the industry a rather unusual number which we believe will help pave the way to even more rapid progress than has marked the past.

In the pages of this issue some of the most capable men in the field — men whose names are indelibly stamped upon the record of this industry's progress—are going to speak their minds about the future. They will tell our readers what they expect to happen in their own special departments of concrete work. Taken together, these opinions will form the best possible picture of what the future holds for this industry and the people in it.

What these men have to say will be interesting, of course, but of direct dollars and cents value as well. Each branch of the industry will be considered by a man competent to forecast its development in the years ahead of us. Wide-awake concretors, measuring their own plans for the future against these expert opinions, will find an invaluable means of confirmation or correction available to their service.

Any industry yields its greatest benefits to those who look ahead and make their plans fit in with its developments. And this issue will help you do that very thing. You will read it with interest—and then keep it on your desk ready to your hand as a guide and inspiration for the coming years.

Road Builders Meet at Cleveland

Twenty-Sixth Annual Convention and Road Show Illustrates Advances Made in Pavement Construction Equipment and Summarizes Road Building Methods

FROM January 14th to January 18th, the men engaged in every division of road and street building flocked into Cleveland to attend the Twenty-sixth Annual Road Show and Convention of the American Road Builders Association. From every state in the union, from Canada and from the countries to the south, engineers, contractors and public officials came to see the latest improvements in road making machinery, to listen to the papers on the program and to meet their fellow laborers in this tremendous industry that has grown out of the need for traffic surfaces suited to today's demands.

Road Show Bigger Than Ever

Again, as was the case last year, the equipment displayed filled the two floors of the great public auditorium, spilled over into the commodious annex, filled the armory across the street and even utilized some of the vacant lots in the vicinity. More than 400 exhibitors displayed their newest road building equipment and materials on the eight acres of floor space devoted to that purpose.

To one who attended previous road shows, several things would stand out as illustrating the trends that are influencing construction practice. For instance, the large amount of batching and weighing equipment and the refinements in equipment design that permit more accurate work are indicative of the recent changes in pavement specifications. More than ever before, equipment is designed to enable the builder to control the quality of the concrete more completely, and to eliminate as far as can be, the possibility of error or inaccuracy.

Equipment, also, is being built heavier and more substantial than in the earlier road show days. It indicates a tendency among contractors to buy machinery on a performance basis, rather than on a first-cost basis, as has too often been the case in the past. The equipment displayed was built for durability and low upkeep costs. Road forms, for instance, and finishing machines, are heavier and sturdier than before.

Another point that impressed visitors was the fact that the exhibits this year were sincere and helpful. There was less "gingerbread" and ostentation. The exhibits looked as if they were put there for the purpose of instructing the visitor and enabled him to get the information he was after more directly. The road show has become more business-like and therefore more helpful to those who attend. Another improvement was the absence of magazine subscription solicitors, who in some previous road shows operated out in the aisles and corridors to the annoyance of visitors.

A survey of the equipment exhibited provides a close parallel with an examination of specification trends. As more states switch over to weight measurement, more equipment of this type is displayed. The continually increasing stress laid on smooth concrete pavement surfaces finds its counterpart in the improvements of existing pavement finishing equipment and in the development of new finishing machines. Closer attention to quality control of the concrete finds the equipment manufacturers ready to give the contractor pavers that are designed to meet these newer requirements with the least difficulty.

The steadily mounting interest in central mixing plants was strikingly evidenced in the exhibits. Many types of specially designed agitator bodies for hauling mixed concrete from the plant to the job were displayed. Several makes of truck bodies that mix the concrete either en route to the job or at arrival, were prominent. The interest displayed at these exhibits indicates the pace at which this branch of the concrete industry is progressing. At the bin and proportioning device exhibits, also, much of the conversation revolved around the subject of central mixing plants.

The Programs

As was the case last year, the sessions of the convention were separated into two divisions—one for the engineers and one for the contractors. Tuesday, January 15, was the opening session. This was a joint session of general interest to all. Tuesday afternoon was the City Officials session at which reports of the committees on administration, design and construction, subgrades, maintenance and traffic were presented. Concurrently with this session was a constructor's session dealing with contractor's problems from the legal angle. Wednesday morning the Pan American session was held, and in the afternoon the sessions were again divided into two groups. Two papers read at the constructor's session are of particular interest to concretors. One was presented by G. N. Childs, of Eau Claire, Wis., on the subject of "Recent Changes in Pavement Design and Specifications and How they Affect the Contractor." He stressed the fact that the trend in specifications is to emphasize results rather than methods. He pointed out how some specifications devoted paragraphs and even pages to a detailed description of the methods to be used and ended up with the provision that if such a method was not satisfactory to the engineer, he could change it at his discretion. The more recent specifications aim particularly at the result and give the contractor greater latitude in choosing his methods. Such a trend is seen in the concrete specifications which require definite strengths at definite times, rather than arbitrary proportions.

High Early Strength Cement

Another paper, presented at the same session, is of particular interest to concretors. It was presented by Duff A. Abrams of the International Cement Corp. under the title, "The Use of High Early Strength Cement in Highway Work." The entire paper, as read, will be found on other pages in this issue.

Considerable discussion followed the presentation of this paper. There was much interest displayed in this subject and the discussion revealed the fact that further information regarding early strength concrete was desired by highway contractors.

On January 17, the last of the convention, the morning sessions were again split into two divisions—one for the county officials and one for equipment manufacturers. The convention closed with an afternoon session of the county highway officials division at which reports of the committees on legislation, administration, county equipment and highway finance were presented.

New Conditions in Products Industry Topic of Wisconsin Convention

Mass Production, Cost Cutting, Mergers, Better Merchandising Methods, Multiple Shift Operation, Light Weight Aggregates, Specialties and Organized Competition Are Some of the Subjects Examined at Wisconsin's Products Association Convention at Milwaukee

WHEN Les Grube, retiring president of the Wisconsin Concrete Products Association opened the seventh annual convention of that organization at Milwaukee on January 10th, he sounded the keynote of the discussions in the statement that "whenever concrete products manufacturers meet, the favorite topic of conversation is the change that has come over the industry in the last few years."

It is these changes—their causes and their probable effects on the industry in the future—that were the basis of the serious discussions that made up the program of the convention. A large share of the success of these Wisconsin meetings is due to the frankness and thoroughness characterizing the discussions. There was much difference of opinion. Viewpoints were frankly and emphatically expressed and then as frankly and emphatically disagreed with. But a spirit of tolerance and good nature underlaid all the discussions. In fact, it is these frank, helpful differences of opinions and the facts they brought out that made every one who attended feel that this was one of the most valuable meetings ever held.

Nor was this meeting one of the "Pollyanna" kind where the praises of the product were sung and where mutual admiration ruled the day. These products manufacturers realized that important influences were acting and that the products business is not a rainbow trail to the mythical pot of gold. That much progress has been made was freely granted, but always there was the supplementary thought that if this progress is to be continued, it can only be done by greater co-operative effort.

When, toward the end of the meeting, "Spec" Collins, the incoming president, took the gavel, he said something concerning these enlarged plans for the future. It is the hope of the Wisconsin Association to put a paid, full-time secretary in the field so that the new plans of the organization may be aggressively carried out. A levy of about ¼ cent per unit on the 12,000,000 units produced in the state would provide funds to carry out an advertising campaign and to pay the salaries.

Secretary's Report

At the height of the 1928 season, Mr. Bushnell, who was acting as secretary of the organization, was called to the Chicago office of the Portland Cement Association and the Wisconsin group was left without a secretary to carry on the detailed work. At that time a meeting of the directors was called and Jack Franklin, representing the Consolidated Concrete Machinery Corp., was elected to carry on the work. How well that work was carried out is shown by the results obtained.

The progress in volume of block manufactured is commented on in the secretary's report as follows: "The production of concrete products in Wisconsin has progressed at a rapid pace during the past year. For example, in Milwaukee alone, in 1927, eight million block were produced, and in 1928, although building permits dropped 17 per cent, production was eleven million block—an increase of almost 40 per cent.

"During the past year another light-weight material has been developed, and it is this class of material that is getting the products manufacturer out of the basement and into the superstructure, where real volume is obtained. (This is described later.)

"My prediction is that in 1929, fifteen million block will be produced and sold in Milwaukee."

Jack Franklin's report closes with some words of appreciation for the assistance given him in his work by L. S. Brodd, district engineer for the Portland Cement Association for Wisconsin, Miss Gladys Burnquist who handled the detailed office work and the other officers of the association who gave freely of their time to further the common good of the industry.

It is a notable fact that the success of this organization is the result of unusually enthusiastic and energetic work. It is this sustained interest and effort that has made the Wisconsin group one of the strongest associations of its kind.

"Putting Promotion in Motion"

The first feature of the program was the now well known "sales school" put on by the cement products bureau of the Portland Cement Association. The school proper was conducted by Bob Smythe and the discussion that followed, by T. H. Merriam. Bill Allan introduced the subject by presenting some recent statistics on the volume of concrete block produced in the United States during 1928. The figures are as follows:

1928 production.......387,000,000 units (8 by 8 by 16 basis)
1927 production.......355,000,000 units (8 by 8 by 16 basis)

32,000,000 units, increase approximately ten per cent.

Per capita use in 1927.................................... 2.9
Per capita use in 1928.................................... 3.2

It was pointed out that this 10 per cent increase in production was secured in the face of the fact that the sales of face brick fell 6 per cent and common brick fell 9 per cent during the same period.

Another interesting point brought out was that during 1928, 39 plants produced more than a million block each, an increase of 11 plants that come into the million block class during the year. It was further shown that it was the larger plants that showed the greatest increase in volume of production. Twenty-three per cent of the plants produced 75 per cent of the total production.

The Sales School

Basing his discussion on the three fundamental requirements of successful products plant operation—(1) a quality product (2) economically manufactured (3) and aggressively merchandised—Bob Smythe proceeded to analyze the present needs of the industry. To aid him in this analysis, a set of slides was used which helped to fix the principles in the listeners' minds.

After pointing out the fact that competing materials were being more energetically advertised and promoted than ever before, the discussion centered around concrete block merchandising in all its phases.

The first principle presented was that *manufacturing costs must be cut.* This was the premise on which the entire school was based and it was around this feature that one of the most interesting discussions of the meeting centered. It was Mr. Smythe's contention that the greatest economies in operating costs could be effected by running the plant on the multiple shift basis. His reasons for this statement follow:

Assume, for purposes of illustration, a one-machine plant having a capacity of 1,000 block per 8-hour shift. The equipment of such a plant would cost around $7,500. Fixed carrying charges on such a plant would be:

Interest	$ 450
Insurance	93
Rent	1560
Power	180
Taxes	177
Depreciation	1500
Phone	36
Water	12
Total	$4008

These fixed carrying charges would exist even if the plant were standing idle all year and would be practically identical (except for power and water) regardless of the number of block produced. Now, if only 10 block were produced in a year, the overhead, or fixed carrying charges would be $400 per block. As production increased, the fixed charges per block would decrease at about the following rate:

For a production of 100,000 block annually..4c. per block
For a production of 200,000 block annually..2c. per block
For a production of 400,000 block annually..1c. per block
For a production of 800,000 block annually..½c. per block

To secure 100 per cent efficiency in the plant and on the investment, the plant would need to operate 1095 shifts per year, or three 8-hour shifts every day in the calendar.

In plants operating one shift per day from February 15 to November 15, an efficiency of only 21 per cent is obtained. If 300 shifts are operated, the efficiency is 27 per cent; and if 600 shifts are operated, the efficiency is 58 per cent. Mr. Smythe urged that products manufacturers make use of multiple shift operation in order to decrease the fixed carrying charges per block.

As most plants are equipped to supply the normal market in their sales radius with one-shift operation, sales must be increased if the manufacturer is to benefit from multiple shift operation. Mr. Smythe then said that increased production will pay the added sales expense, and illustrated the statement as follows:

Taking the same plant used as an example before, A operates the plant to secure a production of 100,000 block annually, and B makes 300,000 block annually. We then have:

	A	B
Units sold	100,000	300,000
Selling price	same	same
Fixed costs	4c.	1 1/3c.
Sales overhead	none	2c.
Margin of profit	3c.	3 2/3c.
Net Profit	$3,000	$11,000

On the above basis, it was shown that even though the selling cost was raised to 2 cents per block, the increased production cut the fixed charges to a point where B was able to realize a profit of 3 2/3 cents per block against A's profit of only 3 cents per block. Thus the increased production would not only take care of the sales cost, but would yield a greater profit per block on a trebled production schedule. (This was the point that was disputed in the discussion, as reported below.)

The trend, therefore, My. Smythe said, was toward greater production and the employment of full-time salesmen to dispose of the block. In 1918 there were only 10 full-time products salesmen in the entire United States, while in 1927 there were more than 300. In Philadelphia, for instance, there were only 4 salesmen in 1918 and 30 in 1928. During this same period, block sales in that city increased from 3,000,000 in 1918 to 13,000,000 in 1928.

The balance of Mr. Smythe's talk pointed out selling methods used with success by various products manufacturers, sources of authentic information that helped sales and advertising methods.

Discussion

The concensus of opinion, as brought out in the spirited discussion that followed Mr. Smythe's talk, was that the double shift was not practical in the middle west. Lined up in favor of multiple shift operation were Bill Allan and Mr. Bullen. Against them were arrayed Austin Crabbs, Ben Wilk, Cal Gochnaur, Al. Scheer and others. The attitude of those questioning the wisdom of double shift operation was not one of antagonism, but rather of doubt. They "wanted to be shown" that the benefits referred to were actual and not theoretical.

The doubtful ones brought out the points that some of them had actually tried to operate with two shifts and had abandoned it because it did not prove feasible. It was contended that double shift operation did not reduce fixed costs in the proportion indicated by Mr. Smythe. Double shift operation, they said, required an extra superintendent, an extra repair man, increased curing room facilities, more pallets, increased machinery repairs, lower production per man at night, etc. In addition, it was pointed out that good men were hard to secure for night work in the smaller middle western towns.

Al Scheer told how he had tried operating on the double shift plan, but found that his cost per block was considerably higher during the second shift than during the first. He also found that he secured greater production per man per day when he cut the working day from 10 hours to 8 hours. This opinion was emphatically endorsed by several of the manufacturers present.

Bill Allan stuck to his guns and said that he was "willing to go on record that five years from now these same products manufacturers who are now unconvinced will all be operating on a multiple shift basis." The discussion continued for some time even after Mr. Merriam had officially closed that section of the program. The manufacturers insisted on more time to carry the discussion further and Les Grube again took the chair to permit a continuation of the subject. As Les Grube said at the next session, there were 87 men in the room during this discussion and only one man left—and he returned.

Manufacture and Sale of Concrete Products

The morning of the second day was devoted to a series of 10-minute papers grouped under the above general title. They covered the problem of the small factory and gave the experiences of two Wisconsin manufacturers with new specialties they had taken on. There is so much of value in these papers that abstracts of them are presented on other pages of this issue.

Trimming Our Sales

The first paper on the concluding afternoon's program was one on the subject of concrete trimstone, presented by A. E. Broker of the Badger Cement Tile Co., Plymouth, Wis., under the caption, "Trimming Our Sales." Extracts from this paper follow:

"The word 'Trim' suggests two meanings, one relating to adornment or beautification and the other to curtailment and the word can be used in connection with the cast stone business with either meaning.

"During the past few years the use of cast stone building trim has grown by leaps and bounds due to various reasons. Architects have come to recognize this material as having possibilities of color and texture that could not be had in any other material. Owners and contractors appreciate the service that can be given. Repetition of ornaments permits additional adornment without increasing the cost to any great extent. These and other considerations have been instrumental in bringing about a wide use of cast stone. Advertising has, of course, been a factor in getting the architect and builder into a receptive frame of mind.

"Along with this increase in the use of cast stone came an increase in the number of manufacturers, a perfectly natural situation which always occurs in every industry which is not restricted by license or patent rights. This alone would not be objectionable as the net amount of production per manufacturer did not hurt the old ones in business as the fact that these new concerns were inexperienced in methods of manufacture and in knowledge of costs, resulting in inferior stone and work done at no profit and usually at a loss. By the time that they were induced to bring their product up to standard and found out that they were losing money they had done irreparable damage to themselves and others in the same line.

"And this is where the 'curtailment' phase of our definition comes in. Curtailment of profits, curtailment of gross business and worst of all, curtailment of friendliness on the part of architects and builders, affecting the non-offending manufacturer as well as those who were guilty.

"Here was a situation that must be remedied before we all went into the hands of receivers, for the only way to get a job was to cut the price to a point where there was no profit. A few of us got together and with the able leadership of Mr. Bushnell of the Portland Cement Association, we organized a state association and invited every one in the business to join us. The first meeting or two took place in Milwaukee, and while not a great deal was accomplished, these gatherings served to acquaint members with each other and pave the way for constructive work later.

"During the past year monthly meetings of the ten members were held in Milwaukee, Oshkosh, Green Bay, Wausau, Racine, Plymouth, and Madison. One of the outstanding accomplishments was an advertising campaign in which a half page was occupied in the 'Western Builder' with a weekly change of copy. Reprints of a few of these advertisements have been distributed among members for use as they may see fit.

"The cost of the advertising and other expenses has been taken care of by dues amounting to $125.00 per member company. We have also taken a group membership in the National Association of Cast Stone Manufacturers, entitling individuals in our state organization to all privileges including voting as a group.

"What we have accomplished by our advertising we do not know, but we believe that it is bearing fruit and that we cannot afford to drop it at this time.

"Getting back to the question of the newcomer in business, we have endeavored to analyze costs of manufacture in such a way that he could apply them to his own conditions. It is unlawful to fix prices and no attempt has been made to do this but there is nothing to prohibit one's proving to his competitor that he is losing money or doing business with too little profit.

"We are striving to improve our quality beyond any chance of criticism and have adopted a standard specification for cast stone which has been placed in the hands of architects and many of them refer to these specifications while others have selected sections and paragraphs which have appealed to them and incorporated them in their own specifications. The new manufacturer must produce a stone which will meet these requirements and this helps to place him on the same basis as the older concerns."

Putting Over Something New

The effective advertising and promotional work done by "Cal" Gochnaur of Appleton has been commented on before in these pages. How he told the people in his sales radius about haydite block and how he put over one of the most successful model house campaigns in co-operation with a local newspaper is told in the paper he presented. There are many suggestions for other concrete products manufacturers in Cal Gochnaur's experiences and his paper will be published in an early issue.

Getting the Most with What You Have

Under the above heading, F. C. Simmonds of the Cincrete Corporation, Milwaukee, stressed the need of keeping the machinery in the plant in good condition and well oiled and repaired. He pointed out the wide variation in production between plants using the same machines and practically the same methods. He told of one plant where 3,100 block were made in a single day on one machine and that this plant produces on an average of about 2,100 block per machine per 9-hour day. In commenting on the subject of the production that could be expected in a well organized plant, he said that in his plant the average production was around 400 block per man per day.

Increasing the Family

Though this subject is generally confined to the inner circles of the home, Les Schwalbe, of the Economy Concrete Products Co., Wauwatosa, Wis., told how his company had increased the family by taking on a new light-weight aggregate, known as "Pottsco." He said, in part:

"We are now making over a million block a year. Our ambitions changed as our business developed. We wanted a larger family, but we wanted to be sure that any adopted child would not only be self-supporting but produce a profit.

"The development of light-weight concrete building units caused us to investigate this field thoroughly. Many propositions have been considered but it was not until late last year that we heard of an aggregate for light-weight concrete, known as Pottsco, particularly suitable for precast building units.

"We knew very little about this aggregate and could find very little information on the subject. The possibilities, however, of this material seemed to be such, that an excellent building unit could be manufactured and sold. Light-weight concrete building units also seemed to offer a field that was developing rapidly and was limited only by the amount of building in a community as it could be promoted for use above grade.

Investigating Light-Weight Aggregates

"We determined to find out for ourselves all that we could about manufacturing concrete block with this aggregate. We carried on experiments for a period of three months before we were ready to offer any units to the public. Our experiments and tests were of the usual type conducted by any products manufacturer endeavoring to produce an economical unit with the materials at hand.

"We manufactured block using various proportions of cement and Pottsco aggregate, also varying the amount of water up to as high as 12 gallons per bag of cement. We also tried other materials in conjunction with this aggregate. Some of these materials were limestone screenings, ordinary sand, lime, and other admixtures. We found that the most economical unit and the best unit could be manufactured by using Pottsco alone as an aggregate.

Features of Nailability

"After conducting various compression tests, we were interested in other qualities of the unit produced from this aggregate. We found excellent nailability. We found that the pull required to remove nails was greater than the pull to remove them from ordinary pine lumber. This we considered a valuable quality for use in larger structures. We found that we could bore holes with an ordinary drill, and several other features that builders would find useful in a masonry building unit.

"In this manner, we have increased our family and we believe the child will grow very rapidly. I believe that other manufacturers who have added some specialty or side line to their business of manufacturing concrete block will do well to investigate other products that can be merchandised in their communities along with the product they are making. It will not do, however, to do this without thorough investigation of the marketing possibilities."

Stripping Down for Action

Considerable mystery and much interest surrounded this closing feature of the program. It was announced in the program that "this feature had been secured at great expense from Hilea and, because of the nature of the act, the participants have requested that their names be left off the program." Suspense had well-nigh reached the breaking point when the time for the feature arrived. Those in the back seats moved toward the front; those halfway in front got up to their feet. No one wanted to miss one bit of this intriguing mystery. "What was coming off?" was the question in every man's mind!

At last the big doors at the side of the hall opened. Every eye was turned. In walked a block mason, carrying his tools. His feet were encased in big, clumsy overshoes; his hands were covered with stiff, thick mittens; his body was crowded into a heavy overcoat and over his eyes were dark, smoked glasses. With many a stumble and fumble he made his hampered way to a pile of concrete block that were stacked in one corner of the room. His tools dropped from his be-mittened hands. His feet stumbled over themselves and over the block. Yet he persisted. In spite of his handicaps, he started to lay up a wall of block. Shades of the ancient and honorable order of concrete block masons! What a wall!

Again there was a stir near the doors. Again every eye turned to see what it could see. In walked Pierrot—grease paint and all. He gazed at the fumbling workman and in his heart welled up a well of pity. For was he not the Spirit of Modern Business? And did he not feel for the poor workman so hampered by unnecessary restrictions? And so Pierrot removes all these useless encumbrances, telling the while these were antiquated business methods, and that in order to succeed, they must be abandoned. One by one, the gloves, the overcoat, the glasses, the overshoes were removed and with each new freedom the mason worked faster and laid up his wall more true and more fine. As wrapping after wrapping was discarded, gradually the familiar face and features of our old friend Julius Sorenson were revealed in all their glory.

The wall was done. Modern business had triumphed. Antiquated methods that bound and restrained were removed. And Pierrot darted through the door only to return as a sedate young man, H. E. Shields of the service department of the Lehigh Portland Cement Co.

Then came a most enlightening lantern slide lecture, bearing out the same theme, namely, the change that a few short years have wrought in every line of activity. We saw how automobiles, ladies' dresses, and any number of things had yielded to the change of the times. And then there was a series of slides that showed how methods of making and using concrete had changed. All fitted in perfectly with the general theme of the entire convention —change.

Oh, yes, there was a banquet also. But that must be shrouded in mystery. He who would know what a Wisconsin Concrete Products Association banquet is like must attend one. It is the only way he can know about it.

$8,000,000,000 Construction in 1928 Breaks All Records

The greatest volume of construction work ever witnessed in the United States during a single year was handled during 1928, according to statistics compiled by the Associated General Contractors of America. The figures, representing construction operations of all types, show an increase of almost 5 per cent above the mark set in 1927.

An estimated value of more than eight billion dollars is placed upon the 1928 construction.

The year just closed was the seventh in succession to witness a rise in the volume of construction activities. Not since 1920 has an annual total shown a decline from the figures set during the preceding year. The 1928 total virtually is double the 1914 figure.

In addition to setting a new annual record, 1928 holds the distinction of having seen a new all-time high mark for a single month established in September.

Records for individual months were broken eight times during 1928, new marks being set in all months except January, February, April and May.

The month-to-month trend last year showed a marked departure from the accustomed lanes. Until May, operations lagged behind activities recorded during the preceding year. A spurt was shown during June; but July and August—months which usually produce high activity—showed a declining tendency. A phenomenal rise in September, inspired by large volumes of contracts previously awarded, served to bring the total for the elapsed portion of the year well above normal. Unusual activities marked the concluding months of the year, with operations defying cold weather with more zest than ever before.

Modern Concrete Methods Used on D. L. & W. R. R. Improvements

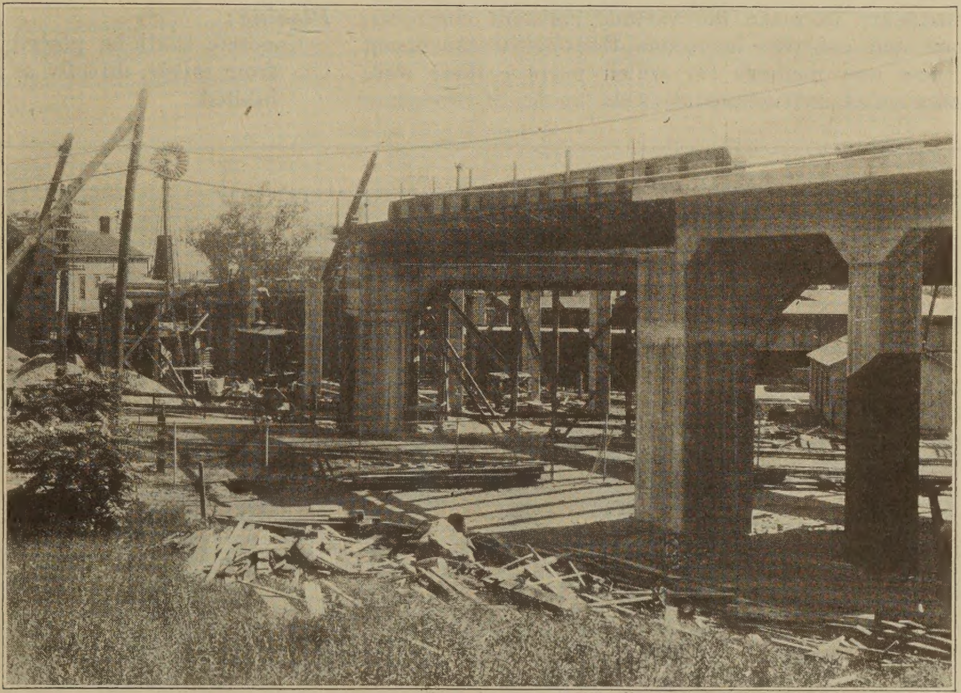
Contractors Co-operate with Lackawanna Railroad in the Use of Modern Concrete Control Methods for Bridge and Viaduct Construction

By M. HIRSCHTHAL
Concrete Engineer, D. L. & W. R. R.

AT the beginning of 1927, the Lackawanna Railroad entered upon an ambitious program of improvements at three points of the Morris and Essex Division, aside from individual structures elsewhere along the system on other divisions. The Morris and Essex Division consists of the Main Line or what is known as the Morristown Line which is subject to heavy suburban traffic; and the Boonton Line which is used chiefly for the heavy freight carried to seaboard from the West by the D. L. & W. R. R. System. These two lines diverge as they emerge from the Bergen Hill Tunnels in Jersey City and are reunited at Denville, N. J., 38 miles from the terminus at Hoboken.

The outstanding project was the construction of a 200 ft. vertical lift span over the lower Hackensack River, on the Morristown Line, a short distance from the Bergen Hill tunnels. Both the lift and tower span piers as well as the piers supporting the deck girder river spans were of concrete, the former carried on concrete caissons driven pneumatically to rock. These river spans were flanked on either side by girderless flat slab viaducts extending about 300 ft. on the west end and 500 ft. on the east end with reinforced concrete abutment and retaining wall on the latter end and an intervening structural span over a city street.

The second project consists of third and fourth tracking of the Boonton line from Boonton to Dover Junction which involved the construction of a number of overhead highway bridges and a number of undercrossings of various types. The overhead bridges are either of the concrete arch type with fill approaches or consist of a structural span over the tracks with concrete approach spans on either side, while concrete slab and girder structures were chosen for the undercrossings.



The Barclay street grade separation, one of the structures built under the new concrete specifications, under construction

The third development which is the one to be described in this article is the Paterson Improvement which includes the elimination of two grade crossings—one by means of an overhead viaduct, the other by a flat top undercrossing, the construction of a new station and retaining walls and stairways in connection with new station facilities and station grounds, together with such grading both excavation and embankment as was necessary to complete the improvements which provided for two additional tracks resulting in a four track line throughout.

Concrete Specifications

In the writing of the specifications for the concrete work for these projects there was a marked, one might say a bold, departure from previous practice in connection with concrete specifications for railroad construction. In 1921 the writer took the first step in this direction when the specifications for the East Orange Improvements of the Morristown Line called for the classes of concrete by strengths with a provision for a specified amount of water per bag of cement for the various classes of concrete and a specified slump to designate the consistency required for the plain and reinforced concrete respectively. The time of mix was of course specified.

For these new projects, however, the writer decided to frame a specification for concrete which made the water-cement ratio the absolute basis of strength of the various classes of concrete in accordance with the approved modern methods. With the approval of these by the chief engineer and the bridge engineer of the railroad, this new type of specification was adopted and sent out for each of the projects of the contractors invited to present their bids. After the requisite explanations, the contractors readily acquiesced in these new methods and were ready to cooperate with the railroad in obtaining the best results. The contractors having become partially acquainted with this method between the time the plans were sent out for bids and the time of awarding the various contracts, it was necessary to make the various assistant engineers, foremen and concrete inspectors thoroughly conversant with these new methods for which purpose there were framed a set of instructions as to the modes of procedure to obtain the results desired together with instructions for taking test specimens.

It was decided to take at least four test cylinders from each pour, two for 28-day test and two for sixty-day tests. Where the pours were large and of reinforced work, 6 specimens were taken to permit of three for each period. This procedure was followed on each of the above mentioned "jobs" as well as on those installed by the railroad company forces elsewhere along the line. The following is a copy of the instructions sent to the company employees connected with concrete work:

Instructions to Concrete Inspectors

Materials:

Cement. Should be fresh—no sign of set or hardening.

Sand. Clean, well graded, make tests for organic and inorganic impurities—decantation test should show no more than 3 per cent of impurities or loam—Colorimetric test for vegetable matter.

Gravel or Stone. Clean—size—maximum size 1¼-in. for reinforcing and 2½-in. for mass.

Water. Clean—free from acid.

Mixing:

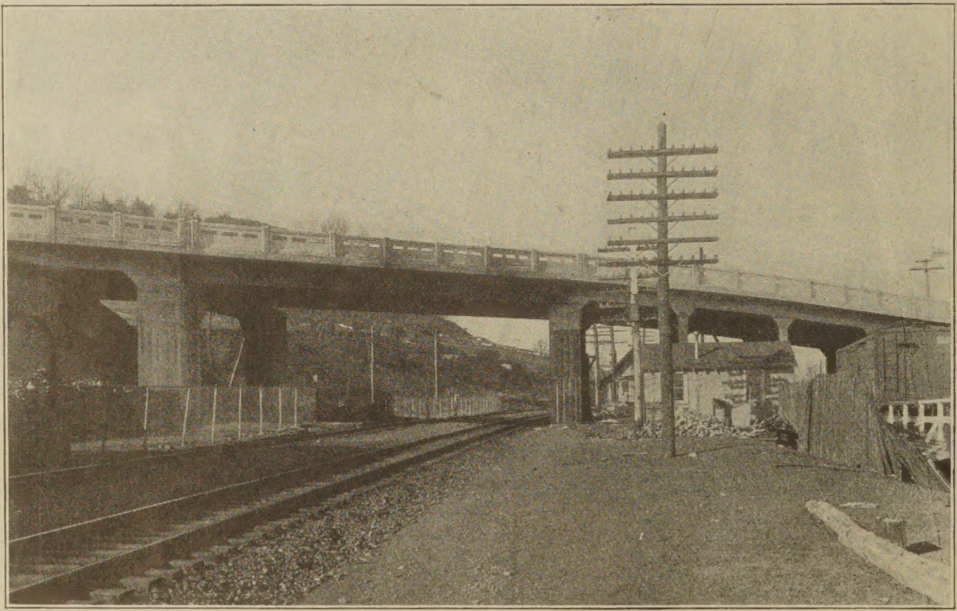
Take account of moisture in aggregate—fine and coarse. Total water to be used inclusive of moisture in aggregate shall be no more than 6¼ gallons per bag of cement for class "A" concrete and no more than 6¾ gallons for class "B" concrete. Add sufficient aggregate in the proportion of about 2 coarse to 1 fine to give slump of 4 to 6 in. for class "A" concrete and 2 in. for class "B" concrete. If mixture is too harsh, take out some coarse aggregate; if oversanded take out some sand.

Time of Mixing. Each batch shall be mixed 1½ minutes after all the ingredients including water are in the mixer. Under no circumstances shall this provision be waived to the extent that the time of mixing is less than 1 1/5 minute.

Placing:

Concrete shall be placed immediately after discharge from mixer, directly as possible—chuting being prohibited.

Concrete shall not be dropped from a height greater than 4 ft. It shall be worked and rodded particularly around reinforcement. Where bulkheads are set for a construction joint such bulkhead shall be painted with "Bonding Contex." Before the next pour is started bulkheaded surface shall be subjected to water through a nozzle so as to leave a rough surface for bonding. Reinforcement must be cleared of rust and forms cleared of debris before concrete is deposited. In cold weather heat must be maintained for at least 3 days. In hot weather thoroughly wet twice a day



The completed overhead crossing at Barclay street. Contractors co-operated with the engineers in the application of the new specifications for 10 days (preferably damp hay).

Test Specimen:

Six-inch cylinders for stone up to 1½-in.—8-in. cylinders for 2-in. Take specimen from forms, not from mixer. Rod concrete well, remove all stones larger than ¼ diameter of cylinder and smooth out surfaces. Subject samples for at least 7 days to same treatment as structure, then ship to Mr. Laudig.

Application of New Specifications

Among the structures to which this new specification applied are the overhead highway bridge at Barclay Street, Paterson, N. J., and the flat-top undercrossing at Mill Street, adjacent to the new Paterson Station, all a part of the new Paterson improvements before mentioned.

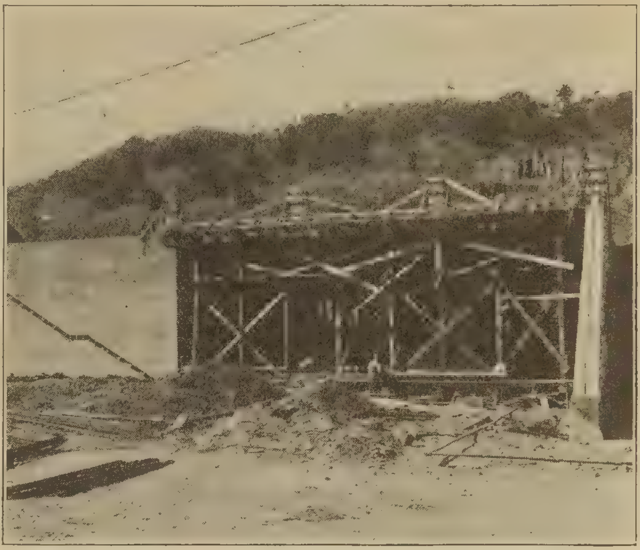
Barclay Street is an important thoroughfare leading from Paterson to the Oranges and Newark and the new bridge was designed to provide a 30-ft. clear roadway and two 10-ft. sidewalks, making a total width of 50 ft. Barclay Street at this point has a break in its alignment resulting in two different angles of intersection, one 52 deg. on the south side, the other 62 deg. 04′ on the north side. Since the road at this point crosses four tracks of the Boonton Line spaced 13 ft. on centers and requiring 8-ft. minimum side clearance on either side for the columns or piers and in addition the angle of crossing is on a sharp skew, the span was prohibitive in reinforced concrete, for a 22-ft. vertical clearance over top of rail. The structural steel span over these tracks was designed to be built on a 95-ft. chord to keep both skew ends of the bridge off the curve of the roadway.

The approach spans on the north side consist of three bays parallel to the line of main piers 25 ft. 6 in. center to center so as to accommodate a track leading to a coal trestle already in operation. At this point an expansion joint was provided to take care of the thermal changes in that length of viaduct. On the other side of the expansion joint, one bay was made parallel to a siding track after which the remaining six bays with spans 20 ft. center to center were made normal to the center line of the roadway. On the south approach the existing grade was very steep so that only two 20-ft. bays of the concrete structure were provided—the remainder of the approach being completed in embankment which also flows under the structure. The grades over the viaduct are 8.45 per cent for the north approaches followed by 1 per cent over the structural span across the tracks and over the south approach, all ascending.

The steel bridge over the tracks was of the through girder type partially encased in concrete, the transverse floor beams with concrete slab spanning the roadway width, while the sidewalks were cantilevered from either girder, the girders being spaced 32 ft. 6 in. apart center to center. This span as well as the concrete approach spans was designed to sustain the load of 20-ton trucks.

The reinforced concrete approach spans were of the two-way reinforced slab and girder type, the girders being supported by two foot square columns along the center line of the viaduct and two parallel lines 21 ft. centers on either side in bays as indicated above. This left 5 ft. of sidewalk on either side to be cantilevered from the facia girders. Both slabs and girders were designed as continuous from expansion point to expansion joint or to the end of the structure as the case might be. The depth required was 3 ft. from crown of concrete to underclearance while the girders were made 2 ft. in width.

The distribution of truck loads on these two-way spans was obtained by considering the truck so located longitudinally as to give a condition of maximum moment and finding the equivalent uniform load giving such moment for one set of wheels. This uniform load was then located transversely along the line of wheels so as to give the maximum moment in that direction and the equivalent uniform load for this moment found and used as the distributed load on the span. The reinforcement used is ⅝-in. round rods. The beams are reinforced with bent up bars and stirrups to take the shears and negative moments over the supports.



The Mill street crossing elimination under construction

The whole structure was waterproofed by means of a two-ply membrane of asphalt saturated fabric laid in asphalt. A novel method of protecting this waterproofing was by means of the use of Hastings asphalt paving blocks which act both as bridge waterproofing and as a pavement at the same time.

The viaduct was surmounted by a reinforced concrete balustrade of which the panels were precast while the posts were cast in place.

The backs of abutments and wing walls were waterproofed by means of emulsified asphalt, applied in two coats

Mill St. Improvement

The bridge for the elimination of the grade crossing at Mill Street built in connection with the Paterson improvement is an undercrossing just west of the new station, and is therefore provided with station platforms and stairways parallel to the track leading to the street on either side at the east abutment. This bridge is a right angled crossing, being normal to the tangent of the railroad center line (which is on a slight curve) at the intersection with the center line of Mill Street. The structure consists of two 24-ft. clear spans with an intervening pier 2 ft. thick with arched openings. The slab is designed as continuous from abutment to abutment across the center pier and is restrained at both abutments. The loading designed for is the Cooper's E-65 Engine Loading, with impact as derived by the formula

$$I = \frac{L.L. \times L.L.}{L.L. + D.L.}.$$

The depth of slab required for these conditions is 2 ft. 11½ in. at the center sloping to 2 ft. 9 in. at abutments to provide drainage.

For this depth of floor the reinforcement required is 1-in. square bars 4½ in. on centers at the center of each span and 1-in. square bars 4½ in. on centers over the center support which are provided by bending up alternate bars in each span with the addition of short 1-in. round rods 9 in. center to center. The restraint at the abutments is provided by 1-in. square bars spaced 1 ft. 6 in. centers.

The platform curbs on either side were designed as girders with a depth from the bottom of slab to 9 in. above the top of rail to carry the platforms which are supported on brackets spaced 9 ft. on centers. The walls supporting the stairways on the east end of the bridge act as retaining walls to retain the railroad embankment, while on the west side of the street gravity wing walls are provided for that purpose at a slope of 1:7 to 1:0 normal to the face of the bridge.

The bridge floor and sides of girders were likewise waterproofed by the application of a two-ply asphalt saturated fabric laid in asphalt and protected by a special asphalt block 8 by 4 by 1¼ in., on the horizontal and by common brick on the vertical surfaces. The backs of the abutments and wing walls were waterproofed by means of emulsified asphalt applied in two coats, the first coat a priming coat, the second coat a thick finishing coat sufficient to withstand the effect of the fill. This bridge is also surmounted by a concrete balustrade.

Test Results

Throughout the construction of both these structures as well as the remainder of the construction on this improvement, test cylinders were taken from each pour, shipped to the company's laboratory at Scranton and a careful check thus kept of the work as it progressed.

The unit stresses used in the design of this work are as follows:

	Square Inches
Concrete in extreme fibre	650
Concrete in shear	40
Concrete in direct compression	500
Concrete in bond (deformed bars)	100
Steel in tension	16,000

Personnel

The design and construction were both completed under the general supervision of G. J. Ray, as chief engineer. The structures were designed under the direction of J. L. Vogel, bridge engineer, and the writer, while the construction was supervised by M. H. Doughty as division engineer, with W. H. Speirs as resident engineer. James Hart was the contractor who executed the work of installing all these structures as well as the accompanying grading, etc., to complete the Paterson improvements.

Use Highway Signs of Colored Concrete in Ohio

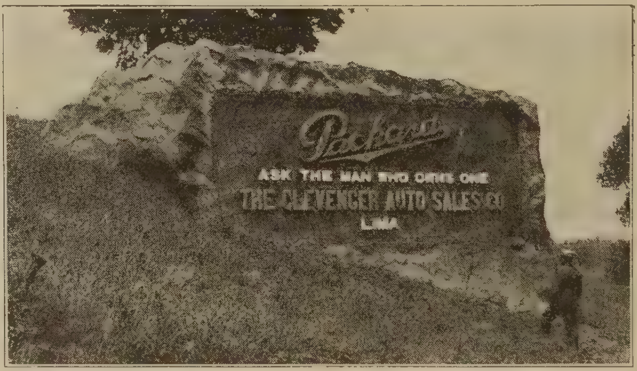
The Edray Artstone Advertising Company, of Lima, Ohio, builds permanent signs of colored concrete, which are exceptionally attractive. The letters stand out from the face of the sign and are of concrete. Almost any desired colors may be used.

The Lincoln Highway Garage sign, in the accompanying photograph, has a red panel, white letters, and a blue border, as those colors are used for the official Lincoln Highway signs. The Packard sign is colored to represent red sandstone and the letters are orange and white.

The standard rectangular signs are set on a concrete foundation 3 ft. deep. The framework is made of 5 channels each 5 in. by 2 in., set vertically, to which four 1½ by 1½-in. angles are attached horizontally. The horizontal members have holes in them through which ⅜-in. rods are run vertically, spaced 14 in. center to center. This framework is covered by metal lath.

A scratch coat of 1:2 mortar containing about 10 per cent of lime and hair is then put on. This is about ⅜ in. thick. The second coat is about ¾-in. thick and is a 1:2½ mortar with an admixture of 10 per cent lime.

The border is put on next. It projects about 1½ in. from the previous flat face. It is followed by a layer of mortar 1½ in. thick, put on where the letters will be. The letters are cut out of this coat while the mortar is still soft. The panel forming a background for the letters is put on last and is about 1¼ in. thick. It is possible to have lettering on both sides of the sign.



Mineral pigments are used for coloring. They are mixed with the cement to assure uniform distribution.

In a recent storm, telephone poles were laid flat and all the other signs in the neighborhood were blown down, but not one of the concrete signs was damaged.

The signs are put up on a rental basis. The method of building them and of making the letters is patented.

EDITORIAL

Sturdier Equipment

VISITORS to this year's Road Show could not help being impressed with the sturdy construction of the pavement building equipment exhibited. More than ever before, equipment is being designed and built from the standpoint of satisfactory and economical performance rather than from an effort to keep the first cost down to a point where operating economy is sacrificed.

Such a condition indicates a growing change in the buying habits of the contractor. He is learning the wisdom of buying on a performance basis rather than on a price basis.

The contractor himself is active in an attempt to show architects and builders that the quality of his work should be taken into consideration in awarding contracts. He feels it is unjust to select the contractor simply on a price competitive basis. Carrying this attitude into his operating policies, the contractor is demanding that the equipment he buys be designed primarily for economical operation. He realizes that, in the long run, such equipment actually costs less.

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An Airport for Every Town

NOT long ago, when highway construction first found its stride, it was not uncommon to see traffic and its inseparable fellow traveller, good business, entirely ignore some previously important towns and transfer their benefits to other towns that were more favorably situated with regard to accessibility by highway. Progressive cities and villages made every effort to secure the advantages of paved highways, for they realized that over them came prosperity. Investments in highway improvement paid dividends.

Today there is another parallel development. The country is being crisscrossed by airplane routes. Air traffic, like highway traffic, follows the routes that best serve it. Progressive cities are making provision ***now*** to secure the benefits of this new but lustily growing means of transportation. Cities and towns without airports may soon find themselves in a predicament similar to that of the communities that permitted highway improvement to pass them by.

This new industry is offering concretors a new opportunity as did highway improvement several years ago. The far-sighted concretor who helped his community to secure paved highways and modern stadiums now again has a similar opportunity to increase the scope of his operations by using his influence to secure another needed improvement—a modern airport.

Concrete Products Research

IT has been the opinion of some members of sectional concrete products associations that not much of a field of usefulness is left to them. They say that the various products committees of the American Concrete Institute and the research activities of other organizations have taken on this work and that, therefore, the products associations themselves have no opportunity along these lines.

Yet there are many problems in the concrete products industry on which the last word has not yet been said. Some of these are of the type that are of national interest; others are of more local importance. They cover a wide range from the technical angle to the administrative angle.

One sectional organization—the Northwest Concrete Products Association—recently completed an investigation of a special problem through co-operation with the graduate school of the University of Washington. A graduate student, working in the plants of the members of the association, used this problem as the basis of his thesis. As a result, both organizations benefited—the university by the co-operation of the manufacturers and the association by the results of the investigation.

Would not such co-operative research be of value to other sectional associations? It is not difficult to make arrangements with the faculty and students to undertake such work. Usually the faculty and the students welcome suggestions for studies that will be of practical value. Also they will be very appreciative of the co-operation of products manufacturers who will open their plants to the student and co-operate with him.

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A Helpful Advertising Campaign

NO concrete contractor, architect or products manufacturer should overlook the opportunities offered to him by the new advertising campaign which the Portland Cement Association is now launching for the purpose of gaining greater acceptance for concrete building products in the finer types of structures.

Such a campaign, appealing to home owners of the better class, architects, builders and bankers, has long been needed to back up and round out the efforts of the individual architects, contractors and products manufacturers who have already seen the possibilities of concrete in architecture.

The effect of such an effort is multiplied when these men who actually design and construct buildings of the type advertised supplement this nationwide campaign with local advertising and personal calls.

P. G. RILEY
President

P. G. RILEY

GENERAL CONTRACTOR

T. G. McGOVERN
General Supt.

~~701 Temple Street, Pittstown, N. Y.~~

Los Angeles

Dear Mac:

Jock Morrison, who is in the equipment business out here, dropped in the other night for a chat and a smoke and said, "Well, old timer, what's the old high-brow reading?" and I told him, "David Harum—haven't read it for years."

After Jock had his big pipe going like a furnace, I said, "Jock, are there any David Harums in the contracting business any more?"

"You mean horse traders," he asked. "Nope, not many, but some contractors feel that as long as they are asked to bid on work the fellow selling 'em equipment should bid, too, and some still let their business go to the lowest bidder. I was up against a horse trader today, a regular David Harum himself, although he would resent the application of the name."

"Well, Jock," I prodded, "did he get your scalp?"

"Well," says Jock, "if you must have it here goes. Our city salesman was away this morning and a call came in from—well, we will call him Harum,—and as the call seemed urgent and I knew him, I went over to his office."

"'Jock,' he says, 'this machine your salesman has been talking to me about, I have been watching it work on McGrath's job and I like it. My superintendent has used one of them before he came with me and he likes it better than anything he has ever used. I want to buy it but it looks like you will have to figure close if you want the order.'

"'Yes,' says I, 'go on and tell me why.'

"'Well,' he continues, 'to tell you the truth, I was all set to buy your machine when a competitor of yours suggested my trading in my old machine and offered me $360 for it. Then another competitor came in and I mentioned the fact that I had received an offer of $360 for it and he offered me $375 for it. And there you are.'

"'Is the machine worth $375?' I asked. 'Not to me it isn't,' says he, 'but it must be to your competitors.'

"'I am a bit curious,' says I, 'about one thing. Does the performance of the new machine enter into this deal at all?'

"'Well, here's the way I look at it,' says Harum, 'each of these other machines will do the work, I guess, so the company who makes the best offer gets the order. Business is business, you know, whether it is a horse trade or purchase of a machine.'

"'In other words,' says I, 'Do unto the other fellow the way he'd like to do unto you and do it fust.' And Harum, I am tempted to accept your order and follow that motto, for I believe you would like it. That is, you would like it now but later you wouldn't and that's just why my horse trading days are over.'

"Well, he didn't like that much and said, 'I should resent that, Jock, but I am curious to get your slant at this.' 'Alright,' says I, 'and I'll give it to you straight. We both know the real value of that old machine which you think you would be selling, but the truth of the matter is in nine cases out of ten you would be buying it with your own money. Listen, Harum, for every dollar you would force from me in payment for your old machine over its real value I could take a dollar's worth of material and labor off of my machine and for every dollar I could take off of it you would eventually pay out an equal amount and probably more for shut-downs. In this way you would not only eventually buy your old machine but you would jeopardize your own operations and the only thing about the transaction you could count on to be continuous would be the spending of your money.'

"He gets hot under the collar and says, 'Do you think your competitors would do this?'

"'Maybe and maybe not,' I says, 'I am only trying to open your eyes to some possibilities. I am trying to drive home the fact that horse trading tactics don't pay either the buyer or the seller.'

"'Why?' he asked.

"'Harum,' I answered, 'just as one man to another, a price should be based on the cost of producing necessary quality plus a profit large enough to bring a fair return on the capital invested, and that price should be maintained. For, if a price is cut, either the quality must be cut or the profit must be cut. If the quality is cut both the buyer and the seller eventually lose. If the profit is cut, the seller won't be in business very long to give the buyer the service he needs and should have.'

"'If the price is broken down by trade-ins, which in most cases are a cut in price, confidence is shot to pieces, for the buyer will always be watching for the seller to come back. Not only that, but if horse trading tactics are followed there would be a natural tendency upon the part of the manufacturer towards building equipment designed for trading instead of for continuous low up-keep service so the average horse trade for the buyer or seller of equipment turns out to be a boomerang to both.' And making a long story short,—I got the order."

Sincerely yours,

P. G.

This is the tenth letter of a group whose publication began in the May issue of CONCRETE *written by P. G. Riley, retired contractor, to his superintendent, Tom McGovern, back home. "P. G." is taking his ease in California and the distant fields, where he was once so active himself, look mighty green now.*

Perhaps his greatest pleasure is in keeping touch with his superintendent and, off and on, his secretary, Anna Ryan. His being away from the scene of activity has given P. G. some new viewpoints and he manages, in his letters, to convey to the young folks some of the ideas in the back of his head. One of the bits of advice he has already given "Mac" concerned the wisdom of investigating operating performance when buying equipment. At another time he told Mac of the "catch" in the seemingly attractive trade-in offer. There's a lesson, too, he said recently, in not letting old, inefficient equipment eat up the profits.

With the ending of the year, "P. G.," in writing east to his secretary, Anna Ryan, stirs up some memories of his life in the contracting game.

L. G. Lenhardt, Assistant Engineer, in Charge of Land Tunnels, Division of Engineering, Department of Water Supply, Detroit.

Supervision and Inspection of Concrete in Relation to Modern Building Construction.
John M. Bischoff, Commissioner of Buildings and Safety Engineering, Detroit.

Is a Specific Ferro-Concrete Style Evolving?
Francis S. Onderdonk, Instructor, College of Architecture, University of Michigan.

Wednesday, Feb. 13, 9 a. m.

A trip through a portion of the River Rouge Plant of the Ford Motor Co. and through the Ford Airport.

While this is in progress the ladies are to be entertained at a bridge breakfast on the Canadian shore.

Wednesday, Feb. 13, 2 p. m. —Grand Ballroom

(Note also Simultaneous Session in Italian Garden.)

Vice-President Duff A. Abrams, Chairman

Volumetric Changes in Portland Cement Mortars and Concretes. (Preprinted)
Raymond E. Davis, Professor of Civil Engineering, and O. G. Troxell, Assistant Professor of Civil Engineering, University of California.

Comparisons of Methods of Determining Moisture in Sands. (Preprinted)
William R. Johnson, Assistant Engineer, Research Laboratory, Portland Cement Association.

A Scientific Trial Method for Designing Concrete Mixtures. (Preprinted)
R. E. Robb, Professor of Civil Engineering, Evansville College, Evansville, Ind.

Water Tables and Curves for Use in Designing and Estimating Concrete Mixtures. (Preprinted)
Herbert J. Gilkey, Associate Professor of Civil Engineering, University of Colorado.

High Early Strength Concrete. (Preprinted)
E. E. Bauer, Instructor in Civil Engineering, University of Illinois.

The Mechanism of Corrosion of Portland Cement Concrete—With Special Reference to the Role of Crystal Pressure. (Preprinted)
F. O. Anderegg, Senior Industrial Fellow, Atlas Portland Cement Co. Industrial Fellowship, Mellon Institute of Industrial Research, Pittsburgh.

Tests of Retempered Concrete. (Preprinted)
H. F. Gonnerman, Manager, Research Laboratory, and P. M. Woodworth, Assistant Engineer, Research Laboratory, Portland Cement Association.

Concrete Studies at Bull Run Dam. (Preprinted)
T. C. Powers, Bureau of Water Works, Dept. of Public Utilities, Portland, Ore.

Current Researches in Concrete.
Committee E-3, H. F. Gonnerman, Chairman.

Wednesday, Feb. 13, 2 p. m. —Italian Garden Room

Director P. H. Bates, Chairman

The Physical Properties of Commercial Cast Stone. (Preprinted)
John Tucker, Jr. and C. W. Walker, U. S. Bureau of Standards, Washington, D. C.

Testing Concrete for Absorption. (Preprinted)
Fred Weigel, Southern Cement Products Co., Knoxville, Tenn.

The Limitations of the Absorption Test for Concrete Products. (Preprinted)
Raymond Wilson, Associate Chemist, Research Laboratory, Portland Cement Association, Chicago.

Proposed Specifications for Cast Stone. (Preprinted)
Committee P-3, Concrete Stone, L. A. Falco, Chairman, C. G. Walker, Secretary.

Proposed Specifications for Finish Coat Portland Cement Stucco. (Preprinted)
Report of Sub-Committee I on Stucco, of Committee C-3, Treatment of Concrete Surfaces.

The Effect of Curing Temperatures.
R. A. Foley, General Manager, Superior Products Co., Detroit.

Effect of Time of Mix on Non-Plastic Concrete.
Report of Committee P-6, Concrete Products Plant Operation, Benjamin Wilk, Chairman, E. G. Lantz, Secretary.

Proposed Revised Specifications for Concrete Brick.
Report of Committee P-1, Standard Concrete Building Units.

Proposed (Joint Committee) Specifications Reinforced Concrete Culvert Pipe. (Preprinted)
Committee J-2, B. S. Pease, Chairman.

Wednesday, Feb. 13, 8 p. m. —Grand Ballroom

Past-President A. E. Lindau, Chairman

Theme: *"The Development of Specifications for Reinforced Concrete."*

The Development of Specifications for Reinforced Concrete. (Preprinted)
George J. Eyrick, Jr., Specification Writer, Smith, Hinchman and Grylls, Engineers and Architects, Detroit.

Some Considerations for Specifications for Centrally Mixed Concrete.
P. J. Freeman, Chief Engineer, Dept. of Public Works, County of Allegheny, Pittsburgh.

Confusion of Specifications for Aggregates. (Preprinted)
L. E. Williams, Engineer and Director, State Concrete Materials Co., Detroit.

Proposed Revised Purchase Specifications for Concrete Aggregates. (Preprinted)
Committee E-5, Aggregates, R. W. Crum, Chairman, F. H. Jackson, Secretary.

Specifications for the Small Job.
S. C. Hollister, Consulting Engineer, Philadelphia.

Continuity as a Factor in Reinforced Concrete Design. (Preprinted)
Hardy Cross, Professor of Structural Engineering, University of Illinois.

Design of Reinforced Concrete Slabs. (Preprinted)
Joseph A. Wise, Assistant Professor of Structural Engineering, University of Minnesota.

The Absolute Basis of Proportioning Concrete and Its Economy. (Preprinted)
Joseph A. Kitts, Kitts and Tuthill, Concrete Technologists, San Francisco.

Thursday, Feb. 14, 9 a. m. and 2 p. m.—Grand Ballroom

President E. D. Boyer, Chairman

Theme: *"Standards of Performance of Concrete for Various Uses."* Symposium of brief papers on characteristics of concrete needed for various types of structures and conditions of use and exposure.

In Sea Water. (Preprinted)
H. E. Squire, Asst. Harbor Engineer, State Board of Harbor Commissioners, San Francisco.

In Alkali Ground Water. (Preprinted)
C. J. MacKenzie, Dean of Engineering, University of Saskatchewan.

In Concrete Pavement. (Preprinted)
F. H. Jackson, Senior Engineer of Tests, U. S. Bureau of Public Roads, Washington, D. C.

For Industrial Floors. (Preprinted)
John G. Ahlers, Barney-Ahlers Construction Corp., J. J. Lindon, Construction Superintendent, Barney-Ahlers Construction Corp., New York City, and Millard F. Bird, Vice-President, A. C. Horn Sales Corp.

For Masonry Units. (Preprinted)
E. Grant Lantz, Cement Products Bureau, Portland Cement Association, Chicago.

For Stucco. (Preprinted)
Manager, Concrete Products Bureau, Portland Cement Association, Chicago.

For Dwelling Houses. (Preprinted)
S. C. Hollister, Consulting Engineer, Philadelphia.

For Reinforced Concrete Buildings.
N. L. Doe, General Superintendent, Turner Construction Co., New York City.

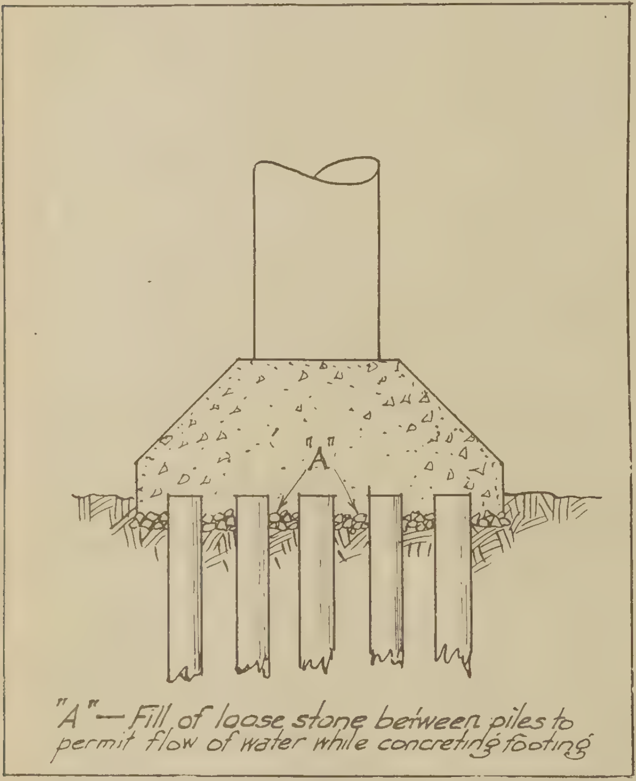
For Fire Resistance.
N. D. Mitchell, U. S. Bureau of Standards, Washington, D. C.

Practical Kinks from the Job

A Difficult Footing Problem Simply Solved

On a recent construction job one deep footing in a low part of the lot was found to be in the bed of a small underground stream. The footing was a pile footing and this particular one was located at a considerable depth below the basement floor because of topographical conditions. The question of concreting the footing without the installation of a pump or without having the water back up and then wash out the concrete was solved in a very simple manner.

After the piles were cut off, the soil in the bed of the stream was excavated to a depth of 12 inches between the piles instead of the usual 6 inches. As shown in the sketch, the lower 6 inches was filled with coarse broken stone through which the water flowed readily. The top of the stone was above the surface of the water and afforded a dry bed on which to place the concrete.


A
"A"—Fill of loose stone between piles to permit flow of water while concreting footing

The flow of the stream was not so great but what it could have been taken care of by diverting and pumping, but in this case a little ingenuity accomplished the desired result at practically no expenditure whatever.

At a later date when the foundation walls for the structure were completed the source of flow was cut off and the back fill around the column footing was placed without danger that the fill under the basement floor would be washed out.

Simplifying the Handling of Reinforcing Steel

On flat slab building construction where the spans are fairly regular, and only a few different lengths of bars are required, it is generally considered most satisfactory to hoist a liberal stock of each size to the floor for storage somewhere ahead of, and convenient to, the area where steel is to be placed. The floor steel gang can then take the required number of bars for each band and slab from the stock racks on the floor as they are required.

Where the job is irregular in plan, or where the bays are of varying sizes, so that a large number of sizes and lengths is required on the floor for each day's work, or where the space for storage on the floor is at a premium, as it usually is, a method that has been employed very satisfactorily by many contractors is to have the yard gang pick out the exact bars for each band and slab, bundle them with No. 16 tie wire, tag them, and pile them near the hoist. They can then be hoisted to the floor in the order that they are wanted by the floor foreman.

This system will work to best advantage if the superintendent or steel foreman will make up tags for the entire floor some time in advance of the erection of forms, and then issue to the yard foreman on steel first the tags required for the steel in the initial fill, and after this has been bundled and tied, the tags for each successive day's fill in turn. In this way the number of bundles which will have to be handled over to find the steel for a given band or slab can be materially reduced, and the operation correspondingly speeded up.

If the steel for bands is kept separate from the steel for slabs, the finding of a given bundle is still further expedited.

The type of tag which has been found most successful as a rule is the small linen tag about 1x2 inches in size. This tag is sturdy enough to stand a great deal of abuse, and even after being wet, and rubbed by adjoining bundles of rusty rods, will still remain legible, particularly if the marking is done with India ink and a coarse pen or a camel's hair brush.

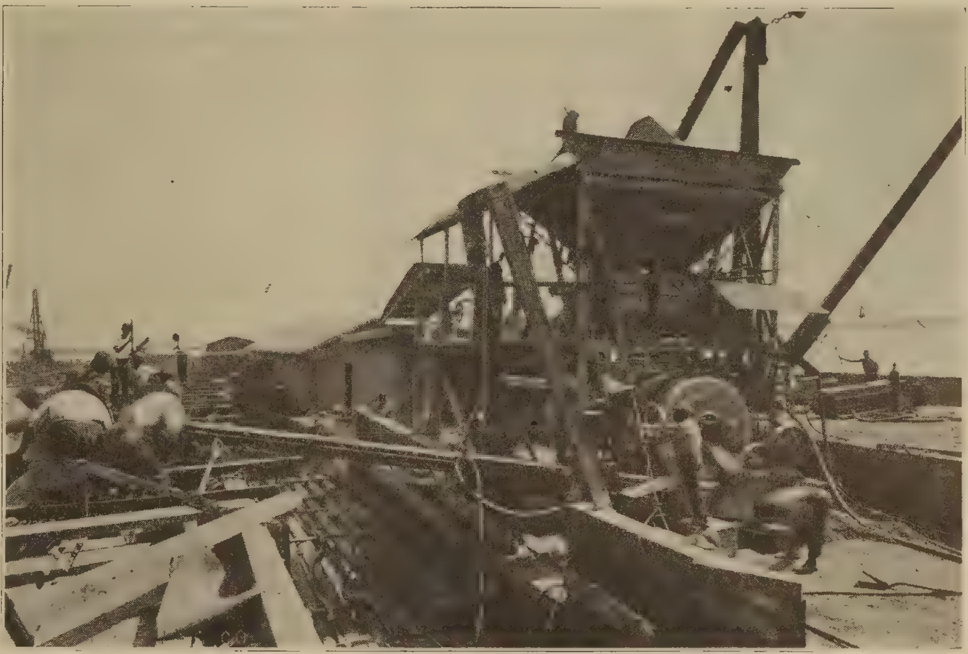
If, at the time that the band or slab number is marked on the tag, the number, size and length of bars is also placed on the tag, the tags will then serve as complete instructions to the yard gang as to the steel to be taken from storage, and this information will be available for the yard foreman in a much more convenient form than is usually the case with the steel blueprints, on which the steel is usually marked with small letters, and which, by the time they have faded a little due to sun and splashed cement mortar, are practically unreadable. The steel foreman in the yard is thereby left free to devote most of his energies to pushing his gang, a very desirable feature, as steel is often racked some distance from the building and the yard man usually has men spread all over the lot, an ideal condition for soldiering if the men are so inclined.

Send in those kinks—the other fellow will be interested. "Concrete" will pay from $2 to $5 for each.

Concrete for Harbor Terminal Placed with Belt Conveyor

Floating Mixing Plant Delivers Concrete to Forms by Means of a Belt Conveyor—Plant Description—Place 200 Cu. Yds. per 8-Hour Day

EACH job presents its own individual problem in the arrangement of a concrete placing plant. And for every job there is a plant layout that meets the needs of that particular job most economically. Conditions that dictate the method of receiving aggregates, the area over which the concrete must be placed, availability of space for the storage of materials and other conditions that apply to the particular job in hand must have a definite influence in the type of concreting plant that is selected.



The mixer barge, showing the belt conveyor which deposits 200 cu. yds. of concrete per day. Note the arrangement for supporting the conveyor

In building a section of a large harbor terminal at Locust Point in Baltimore Harbor, the Merritt-Chapman & Scott Corporation, contractors, arranged a plant that was adapted particularly to the conditions of that particular job. With this plant the contractors were able to place up to 200 cubic yards of concrete per 8-hour day with an unusually small force. A point of interest in the job was the fact that a belt conveyor was found to be an efficient means of transporting the concrete from the mixer to the forms.

In order to prevent any possible segregation of the concrete, the upper end of the conveyor discharges into a tremie suspended from a frame

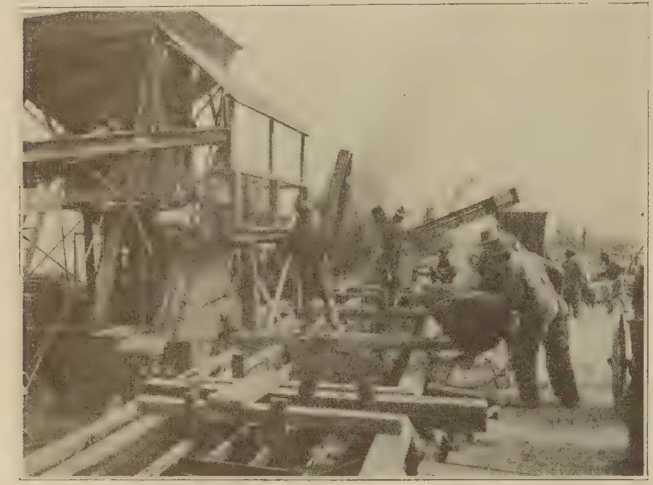
The work under way by the Merritt-Chapman & Scott Corporation is a unit in a $6,000,000 harbor terminal development undertaken by the city of Baltimore and which will be leased by the city to the Western Maryland Railroad. An idea of the size of the project may be had from the fact that it involves driving 50,000 piles from 35 to 90 ft. long. The plant described in this story was used for building one of the piers in this development. The construction of the pier included the building of outside walls, center walls and column pedestals. The pier is surrounded by water on three sides.

Concreting Plant

The mixing plant is mounted on barges, as shown in the illustrations, one barge carrying the mixing and placing equipment, the other a derrick. The mixer barge is equipped with a 1 yd. stationary drum mixer, a batching plant, cement shed, and a portable conveyor for transporting the concrete.

The mixer is mounted high enough to discharge the concrete into a hopper over the belt conveyor, by means of which the flow of the concrete onto the belt is regulated and controlled. The cement platform is placed at an elevation under the measuring hoppers and over the mixer loading hopper. The measuring bins discharge directly into the mixer hopper and cement is added to the batch from the platform. Cement is wheeled from the storage shed on the mixer barge to a cement elevator which lifts the bags to the platform level, as shown in one of the illustrations.

Sand and gravel are received in barges divided into two compartments. These barges are brought alongside the mixing barge and the aggregates are transferred from the barge to the batching plant by a derrick equipped with a clam shell bucket, mounted on another barge. The batching plant provides a storage capacity for about an hour's run.



The other side of the mixing plant, showing the cement conveyor

A portable belt conveyor from which the wheels and carriage have been removed, is carried by a chain block from an "A" frame on the side of the barge. The belt is driven by a two-cylinder gasoline engine, mounted over the elevator frame. A scraper of rubber belting is placed normal to the conveyor belt just below the head pulley; the flashing at the lower end of the belt has been raised and a couple of holes have been put in the frame of the conveyor at the loading end to facilitate hosing the belt and the pulley. Aside from these changes, the belt used is a standard conveyor. The entire conveyor and belt are thoroughly hosed down at least twice a day.

Placing Concrete

Concrete is mixed for a minute and a half with all the materials in the drum. A batch of from 7/8 to 1 cubic yard is turned out every two minutes. The conveyor handles each batch in from 35 to 50 seconds. The hopper between the mixer and the conveyor eliminates the delay in the cycle of mixer operation.

The concrete is mixed to a "sticky" consistency, dry enough to meet the specifications and plastic enough to flow around the reinforcing bars and to insure proper placing. In order to prevent any possible segregation caused by allowing the concrete to fall onto the reinforcing bars, the concrete is discharged at the head end of the conveyor into a tremie suspended from a frame.

The plant has proved very efficient from the standpoint of equipment and labor. Labor distribution is as follows:

1 man on the gravel barge
2 men handling cement
1 man operating the crane
1 mixer operator
1 man at the concrete hopper
1 man cleaning up and odd jobs.
—
7 men. Total crew on the barges.

Ashore, there are 2 men at the conveyor, and one man spading the forms. The output averages about 200 cubic yards of concrete per 8-hour day.

Economic Conditions and Prospects for the Coming Year as Forecast by Secretary of Commerce Whiting

Some of the more important economic forces which dominate the business situation as we enter the New Year are credit conditions, the degree of accumulation of merchandise stocks and of speculation in them, the size of the crops and of our current industrial output, the rate of wages and volume of employment, and the prospects of foreign trade.

With respect to credit conditions, 1928 has been an extraordinary year. The outflow of gold which began in the autumn of 1927 continued during the first half of 1928 and caused a reversal in the easy money situation that had prevailed for several years. Public attention has been fixed on the rise in the rates on stock-exchange 90-day time loans from 4¼ per cent in January to 7½ per cent in the early autumn and the even greater rise in call money rates. It is well, however, to note that bank credit for commercial purposes has been in ample supply at rates ranging from less than one-half per cent higher in southern and western cities to slightly over 1 per cent in New York City while open-market rates for commercial paper have increased by only 1½ per cent during the year.

Agricultural output during the past year was about 5 per cent larger than in 1927 and there was an even greater expansion in manufacturing production, but neither stocks of raw materials nor of manufactured goods have shown any general tendency to accumulate. There is no considerable speculation in commodities and wholesale prices average about the same as a year ago.

Wages continue at a high level and unemployment has been reduced to a minimum. There has been a continued demand for additional workers by mercantile establishments, hotels, and the automotive industry and factories have once more been increasing the number on their pay rolls. Labor conflicts in the coal and cotton textile industries were settled during the past year and relations in most sections of the labor world are now amicable.

Activity in the automotive and construction industries has been sustained and is particularly noteworthy. Automobile production has been at a higher level in recent months than at any earlier period and contracts for future construction have been substantially greater than in the corresponding period a year ago. Production of many related products, such as iron and steel, cement, gasoline, and rubber tires has been stimulated as a result of these developments. The textile and coal industries, however, still lag behind the others.

Foreign, as well as domestic, demand for the products of our farms and factories is steadily expanding. During the past year there has been an exceptionally large growth of our exports of finished manufactures—especially automobiles, machinery, and petroleum products.

In general it may be stated that both industry and trade are exceptionally active as we enter the New Year.

Flexural Strength of Concrete

Effect of Size, Grading and Fineness Modulus of Aggregates, Quantity of Cement, and Water-Cement Ratio on the Flexural Strength of Concrete

By PAUL E. KRESSLY
Consulting Engineer, Los Angeles, Calif.

With this article, Mr. Kressly concludes his series on the effect of the various mix design factors influencing the quality of concrete. The previous articles were published in the December, 1928, issue under the title, "Design of Concrete Mixes," and in the January, 1929, issue under the title, "Design of Concrete Pavement Mixes."

DIAGRAMS 17 to 23, both inclusive, show the results of tests made of concrete beams during 1926 and 1927 as part of a special investigation of the flexural strength of concrete.

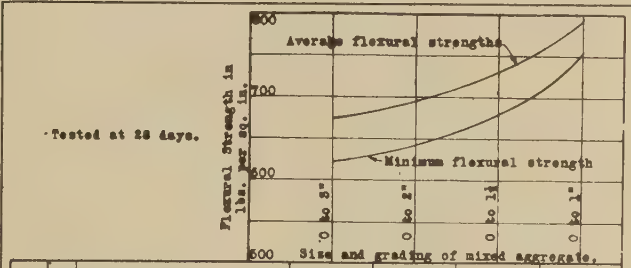
Four hundred twenty beams were made of plain concrete, using the same brand of cement and kind of aggregates. The size of all beams was 6 by 6 by 36 in. Washed sand and gravel was used. Sand and gravel were separated into seven distinct sizes, namely, 0 to 30, 30 to 8, 8 to 4, 4 to ⅜-in., ⅜- to ¾-in., ¾- to 1½-in., and 1½- to 3-in., which were then recombined by weight of dry materials to insure definite and constant grading of the mixed aggregates. Cement and water were also weighed. The mixing time was one minute. A batch of concrete was of a volume sufficient to cast three beams.

The values of average flexural strengths plotted on the respective diagrams are the averages of from 12 to 36 beams. The values of minimum flexural strength represent the lowest strength obtained from the tests of any group of beams.

These tests give definite results for a wide range of size and grading of mixed aggregate, fineness modulus of mixed aggregate, quantity of cement, quantity of water (water-cement ratio) and age, and the effect thereof on the flexural strength of concrete. The following conclusions are based upon the results obtained from these tests.

1. For different sizes and grading of mixed aggregate, namely, 0 to 1-in., 0 to 1½-in., 0 to 2-in. and 0 to 3-in., using the same quantity of cement and relative consistency of mix, the flexural strength increases as the maximum size and grading of mixed aggregate decreases or as the grading becomes finer up to a point where it becomes too fine for the quantity of cement in the mix.
2. For a given size and grading of mixed aggregate, using the same relative consistency of mix and quantity of cement, the percentage of fine aggregate in the mix may vary as much as 15 to 20 per cent by weight without materially affecting the flexural strength.
3. The percentages of fine aggregate in the mix, which produce the highest and most uniform flexural strengths for various sizes and gradings of mixed aggregate, with a given quantity of cement and relative consistency of mix,

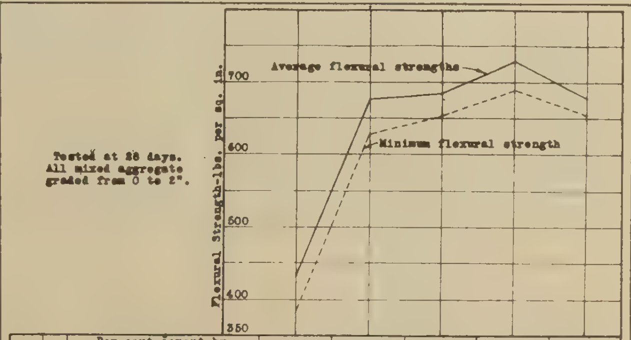
Diagrams Showing Effect of Size and Grading of Mixed Aggregate, Fineness Modulus of Mixed Aggregates, Quantity of Cement in Mix, Water-Cement Ratio and Age Upon the Flexural Strengths of Concrete as Determined by Actual Tests



Design of concrete mixes used in tests.			0 to 3"	0 to 2"	0 to 1½	0 to 1"
Constants.	Fineness modulus, sand		3.90	3.90	3.90	3.90
	Fineness modulus, gravel		8.25	7.96	7.60	7.35
	Relative consistency		100	100	100	100
	Bags of cement per cu. yard of concrete.		6	6	6	6
Variables.	F. M. of mixed aggregate	Minimum	6.28	5.98	5.38	4.94
		Maximum	6.93	6.64	5.94	5.63
	Water-cement ratio	Minimum	0.72	0.74	0.77	0.81
		Maximum	0.76	0.77	0.83	0.87
	Per cent sand in mixed aggregate	Minimum	30	35	45	50
		Maximum	45	50	60	70

DIAGRAM 17

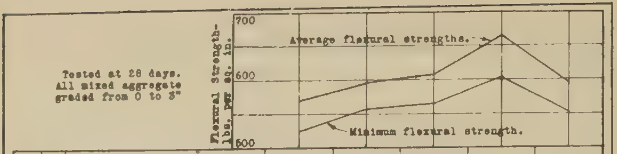
Effect of size and grading of mixed aggregate on the flexural strength of concrete



Design of concrete mixes used in tests.		10%	15%	20%	25%	30%
	Per cent cement by weight of aggregate.	10%	15%	20%	25%	30%
Constants.	Fineness modulus, sand	3.68	3.68	3.68	3.68	3.68
	Fineness modulus, gravel	7.96	7.96	7.96	7.96	7.96
	Fineness modulus of mixed aggregate	6.46	6.46	6.46	6.46	6.46
	Per cent of sand by weight of mixed aggregate.	35%	35%	35%	35%	35%
	Relative consistency	100	100	100	100	100
Variables	Water-cement ratio	1.04	0.80	0.69	0.61	0.57
	Bags of cement per cu. yd. of concrete in place	3.90	5.40	6.75	8.10	9.20

DIAGRAM 18

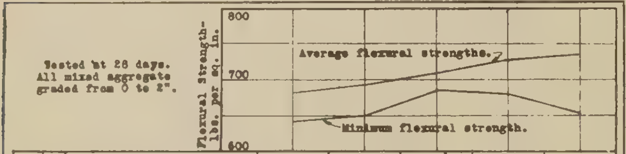
Effect of quantity of cement in the mix on the flexural strength of concrete



Design of concrete mixes used in tests.	Variables.	Maximum permissible fineness modulus of mixed aggregate for the given mix.	7.57	7.18	6.83	6.59	6.49
		Per cent of cement by weight of aggregate.	40%	27%	20%	16%	13%
		Bags of cement per cubic yard of concrete in place.	11.36	8.54	6.82	5.70	4.87
		Mix-parts cement to parts aggregate by weight.	1--2 1/2	1 - 3.75	1 - 5	1 - 6.25	1 - 7.50
		Water-cement ratio	0.49	0.57	0.67	0.77	0.87
		Per cent of sand by weight of aggregate in mix.	17%	25%	32%	37%	39%
	Constants	Relative consistency	100	100	100	100	100
		Fineness Modulus of sand.	3.50	3.50	3.50	3.50	3.50
		Fineness Modulus of gravel	8.40	8.40	8.40	8.40	8.40

DIAGRAM 19

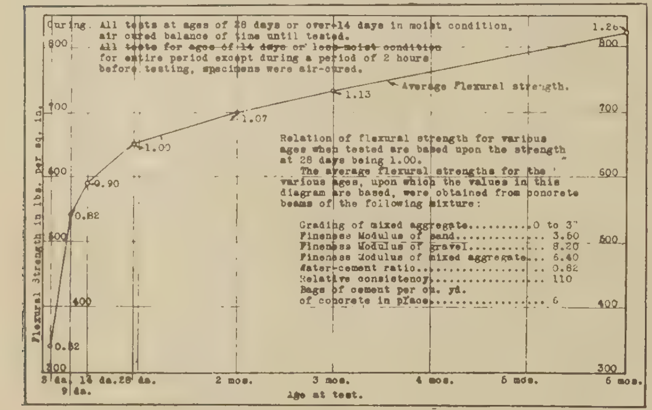
Effect of using maximum permissible fineness moduli of mixed aggregate for various mixes on the flexural strength of concrete



Design of concrete mixes used in tests.	Variables	Fineness Modulus of sand.	2.35	2.75	3.23	3.62	3.98
		Per cent of sand by weight of aggregate in mix.	28%	30%	33%	36%	40%
	Constants.	Fineness Modulus of gravel	8.00	8.00	8.00	8.00	8.00
		Fineness Modulus of mixed aggregate	6.40	6.40	6.40	6.40	6.40
		Water-cement ratio	0.75	0.75	0.75	0.75	0.75
		Bags of cement per cu. yd. of concrete in place	6	6	6	6	6
		Relative consistency	100	100	100	100	100

DIAGRAM 20

Effect of using sand of varying fineness moduli in the same mix on the flexural strength of concrete



Curing. All tests at ages of 28 days or over-14 days in moist condition, air cured balance of time until tested.
~~All tests for ages of 14 days or less-moist condition~~ for entire period except during a period of 2 hours before testing, specimens were air-cured.

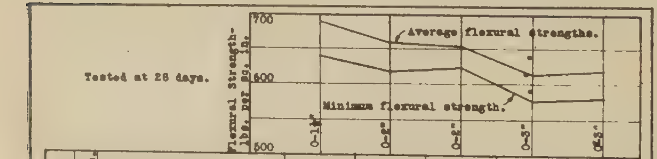
Relation of flexural strength for various ages when tested are based upon the strength at 28 days being 1.00.

The average flexural strengths for the various ages, upon which the values in this diagram are based, were obtained from concrete beams of the following mixture:

Grading of mixed aggregate	0 to 3"
Fineness Modulus of sand	3.50
Fineness Modulus of gravel	8.20
Fineness Modulus of mixed aggregate	6.40
Water-cement ratio	0.82
Relative consistency	110
Bags of cement per cu. yd. of concrete in place	6

DIAGRAM 21

Effect of age on the flexural strength of concrete

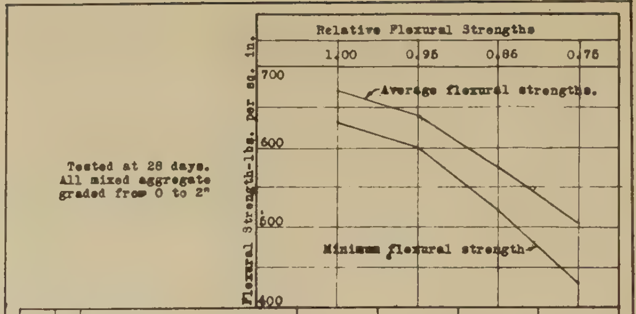


Design of concrete mixes used in tests.	Variables	Fineness Modulus of gravel	7.20	7.60	8.00	8.40	8.80
		Per cent of sand by weight of mixed aggregate	22% See foot note.	29%	35%	41%	45%
	Constants.	Fineness Modulus of sand	3.50	3.50	3.50	3.50	3.50
		Fineness Modulus of mixed aggregate	6.40	6.40	6.40	6.40	6.40
		Relative consistency	100	100	100	100	100
		Water-cement ratio	0.75	0.75	0.75	0.75	0.75
		Bags of cement per cu. yd. of concrete in place	6	6	6	6	6

Note: While only 22% and 29% by weight of sand of Fineness Modulus 3.50 was used in the mix, the gravel of 7.20 and 7.60 Fineness Modulus contained 20% and 10% respectively of material between 4 and 3/8", so that the quantity of sand graded from 0 to 3/8" actually contained in the mixed aggregate is 38% and 36% respectively.

DIAGRAM 22

Effect of using gravel of varying fineness moduli in the same mix on the flexural strength of concrete



Design of concrete mixes used in tests.	Variables	Relative consistency	100	110	120	130
		Water-cement ratio	0.75	0.82	0.90	0.98
	Constants	Fineness Modulus of sand	3.50	3.50	3.50	3.50
		Fineness Modulus of gravel	8.00	8.00	8.00	8.00
		Fineness Modulus of mixed aggregate.	6.40	6.40	6.40	6.40
		Per cent of sand by weight of mixed aggregate.	35%	35%	35%	35%
		Bags of cement per cu. yd. of concrete in place	6	6	6	6

DIAGRAM 23

Effect of water-cement ratio (relative consistency) on the flexural strength of concrete when using a mixed aggregate of the same grading and fineness modulus

are as follows: 0 to 3-in., 40 per cent; 0 to 2-in., 50 per cent; 0 to 1½-in., 55 per cent, and 0 to 1-in., 60 per cent.

4. When fine aggregate of varying fineness moduli is combined with a coarse aggregate of constant fineness modulus, to produce a mixed aggregate of constant fineness modulus, using the same size and grading of aggregate, quantity of cement, water-cement ratio and relative consistency of mix, the flexural strength increases slightly as the fineness modulus of the fine aggregate increases and therefore as the percentage of fine aggregate in the mix increases.

5. With the same relative consistency of mix, size and grading and fineness modulus of mixed aggregate, the flexural strength increases rapidly as the quantity of cement in the mix increases from 10 to 16 per cent, by weight, but there is no material increase in flexural strength as the quantity of cement by weight is increased from 16 to 30 per cent.

6. With the same relative consistency of mix, size and grading of aggregate, when fine and coarse aggregates are combined so as to produce the maximum fineness modulus of mixed aggregate permissible for a given quantity of cement, by weight, in the mix, the flexural strength increases as the quantity of cement, by weight, in the mix, decreases from 40 to 16 per cent with a corresponding decrease of fineness modulus of mixed aggregate of from 7.57 to 6.59. However, as the quantity of cement by weight in the mix becomes less than 16 per cent, even with a decrease in fineness modulus of mixed aggregate, the flexural strength decreases rapidly.

7. With a given quantity of cement, fineness modulus and size and grading of mixed aggregate, the flexural strength decreases as the quantity of water in the mix (water-cement ratio) increases.

8. Increasing the quantity of water (water-cement ratio) in a given mix does not affect the flexural strength of the concrete, provided the fineness modulus of mixed aggregate is decreased without changing the size and grading of aggregate and relative consistency of the mix. On the other hand, the flexural strength of the concrete of this same mix may be increased by decreasing both the fineness modulus and size and grading of the mixed aggregate. This is true even though it is necessary to increase the quantity of water (water-cement ratio) in order to maintain the same relative consistency of the mix.

Commercial Central Mixing Plants for the Manufacture and Sale of Ready Mixed Concrete

Growth in Number of Central Mixing Plants—Selecting the Site—Construction of Plant—Provisions for Cold Weather — Bulk Cement — Truck Bodies — Tests on Hauled Concrete—Prices—Capital Required

By NORMAN BEGGS
Structural and Technical Bureau, Portland Cement Association, Chicago

IN the last few years new central mixing plants for the manufacture and sale of ready mixed concrete have been established in all parts of the country. In 1925 the Portland Cement Association had a list of 25 existing plants. If a similar list were to be compiled today it would contain the names of nearly 100 concerns actually making and selling ready mixed concrete. This shows the recent growth of the industry, is an indication that this class of concrete is being favorably received in many localities, and is a promise for the future. Although certain imperfections still remain in the manufacture, and delivery of ready mixed concrete, the development that follows will tend to remove these difficulties and approach the ideal method of producing high quality concrete.

Selection of Site for New Plant

The first consideration in establishing a central mixing plant is the selection of a suitable location. It should be chosen keeping in mind these three main points: (1) Proximity to the supply and transportation for bringing in concreting materials, (2) probable market for ready mixed concrete, and (3) nature and volume of vehicular traffic. The ground area should be of sufficient size to accommodate the mixing plant and to store a large quantity of materials. A well designed layout will eliminate the chance of a shutdown at a time when continuous operations are necessary.

Often a material dealer goes into the business of making and selling ready mixed concrete. He usually selects a part of the existing material yard as the plant site. A plant built either at the material yard or adjacent to it has an economic advantage as well as the assurance of a constant supply of aggregates. The superiority of a water front site should not be overlooked where economy afforded by using barges for bringing in materials is a factor.

Each plant layout presents an individual problem, the physical characteristics of the property determining to a large extent the general design. Provisions should be made for changes and expansion, so that later improvements may be made with a minimum of expense due to alterations.

Capacity of the Plant

Although difficult to determine, the probable demands on a new central mixing plant should be carefully estimated before construction plans are approved. For quantities up to 150 cu. yds. of concrete per day, a 1-yd. mixer will ordinarily take care of the work. Should a daily production of 250 to 300 cu. yds. be desired, a mixer of 1½-yd. capacity is advisable. Where plants are designed to handle up to 800 cu. yds. of concrete a day, a 3-yd. mixer should be used. With greater capacities it probably will be found desirable to install two 3-yd. mixers and operate both of them rather than to plan on a single mixer of a larger size.

The Ready Mixed Concrete Co. of New York, is housed in this building. The plant is of the gravity type, the overhead bins being loaded by a combination of belt and bucket conveyors. Only a limited storage space is available for aggregates on the plant property but considerable additional storage is obtained by tying up loaded barges at the site

Most plant owners agree that the capacity of the mixer and the capacity of the truck for hauling should be the same. If a difference must exist, the mixer should be one-half or one-third the truck rating. Under those conditions a batch will be one-third, one-half, or a complete load, the latter being the most favorable arrangement. A minimum amount of time is needed for loading a truck when a

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An abstract of a paper presented at the Thirteenth Annual Convention of the National Sand and Gravel Association, Inc., Cleveland, Ohio, January 9, 10, 11.

single charging of the mixer makes an entire load of concrete. The batch may be started as the empty truck, returning from a job, approaches the plant. By the time the driver checks in, receives instructions for his next trip, has the truck washed and drives to the loading position the concrete is thoroughly mixed. His truck is entirely filled by a single batch and he starts for the job immediately. There is no waiting for the second part of the load to be mixed such as is necessary if the mixer capacity is only one-half that of the truck. Most trucks are limited to not more than 3 yds. of concrete, this restriction being placed by a city ordinance providing a maximum load on the streets. The balance of the plant equipment should be designed to prevent tie-ups and delays on account of lack of materials. Any of the large machinery companies will furnish estimates and suggested layouts for plant design.

Building facilities, besides the mixing plant itself, should provide for a plant office, a warehouse for the storage of cement, a garage and a machine shop. It is desirable also to have space set aside for laboratory work where aggregates can be tested and concrete cylinders made and stored. Arrangements for the actual breaking of test cylinders can usually be made with some local laboratory equipped with a suitable testing machine.

Construction of Plant

The gravity type of central mixing plant is the most common form of construction. It is built with overhead storage bins for materials which discharge by gravity into weight batchers that in turn empty into the charging hopper of the mixer. The mixer, sufficiently elevated, dumps directly into the trucks. Most of the plants in existence are designed according to these principles, but there may be certain variations in this plan. For example, one large plant proportions materials by weight at one location, hauls those dry batches in flat bottom trucks a few hundred feet, and dumps them directly into the mixer hopper. Sacked cement is used here and is added at the time the dry batches are dumped. Another plant carries weighed amounts of sand, gravel and cement in a bucket conveyor, discharging them directly into the mixer. The purpose of this arrangement is to save head room because the equipment is installed in an existing building.

Aggregates are usually elevated to the bins either by belt or bucket conveyors. Sometimes a stiff-leg derrick or crane equipped with a clamshell bucket is used for this purpose. Advantage is always taken of any natural rise in the ground which may assist in the elevation of materials.

If bulk cement is used special handling equipment is required. Mixing water is piped from the city supply to a measuring device where the quantity may be accurately controlled. Electric power has been found extremely satisfactory and quite economical for running the mixer and all other possible equipment. Cranes which travel under their own power are usually operated by steam.

A structural framework, preferably enclosed to protect the operators and equipment, supports the plant machinery at different elevations. The ground level is devoted to a driveway running either under or alongside the mixer. On the first floor above grade are the mixer and motor. Above this is the charging or operating floor where the plant operator controls the proportioning of the materials and operates the entire plant. Over this are the storage bins. The total height of the plant varies, ranging between 40 and 60 ft.

Paved driveways speed operations at the plant and are almost a necessity. Heavy trucks soon cut through cinders or other similar surfacing material.

Winter building has become so prevalent in the last few years that the central mixing plant should figure on a fair volume of business during the cold months. Owners of central mixing plants have rapidly come to realize the value of delivering high quality concrete to the buyer, and that in cold weather the quality is seriously affected if heating precautions are not taken. Temperature affects the rate at which concrete hardens, the lower temperatures reducing the rate until it practically stops at the freezing point. Alternate freezing and thawing will completely destroy concrete, while a single freezing may impair the strength and durability. Because of these facts special precautions are required for cold weather work and should be employed whenever it is expected that the temperature will fall as low as 50 deg. F. By supplying live steam to the aggregates through a perforated grillage of pipes lining the storage bins and using hot mixing water, warm concrete can be produced and delivered to any job serviced. In transit open trucks should be covered with a tarpaulin to protect the concrete from the weather and to help conserve the heat. Even during the most severe weather only a small amount of heat is lost by radiation from the truck.

Common or rock salt or other admixtures should not be added to concrete to prevent freezing. When chemicals are used in quantities sufficient to lower the freezing point of water to any extent, they reduce the strength materially.

Bulk Cement

The question of the use of bulk cement is one which often arises at the time of construction of the plant. A number of plants have found it more economical than sacked cement. If protected from strong drafts there is a surprisingly small amount of dust created in handling bulk cement. The savings may be summarized as follows: (1) No labor required for cleaning, handling and shipping empty cement sacks, (2) no lost or damaged sacks, (3) less labor and quicker unloading of cars, sometimes eliminating demurrage, (4) less money required to pay for a carload of cement, (5) no bookkeeping for sacks, (6) no fire insurance to pay on stored sacks, and (7) no storage space to provide for "empties."

One of the common methods of handling bulk cement is by use of an air conveying system, partly hydraulic and partly mechanical in action. It is essentially a tube containing a small screw conveyor fed at the front end by a hopper into which cement from the car is emptied, and equipped at the lower end with an aerated ring through which compressed air enters. Here is attached the conveying pipe, 2 to 6 in. in diameter, depending upon the required capacity. The screw, driven by a small motor, is directly connected to the shaft while the air is controlled by a separate compressor and valves. It is claimed by the manufacturers that the cement is "fluffed up" by the air, held in suspension, and forced through the pipe to the discharge end. At any rate, the volume of the cement is increased and made lighter by the addition of dry air. In this condition it assumes the properties of a fluid and is pushed, not blown, through the conveying pipe by the action of the screw on the incoming cement.

In the storage bin the aerated cement seeks a hydraulic level instead of heaping up under the discharge orifice. From the bin, cement may be drawn into the batcher in any desired quantity by means of a small screw conveyor.

Weight measurement is the only satisfactory method of proportioning loose cement because the volume may change as much as 50 to 100 per cent due to varying amounts of air being included in the mass. Ninety-four pounds is accepted as a standard for 1 cu. ft. of cement.

At the mill, cement is sacked on this basis.

Hauling ready mixed concrete is the biggest problem of the plant owner. This is well illustrated by the fact that out of approximately 100 central mixing plants now operating no standard type of truck body is in general use. The smaller plants employ the ordinary flat bottom dump trucks equipped with a vertical end gate or a hopper-shaped end to help in dumping. The larger plants, for the most part, operate special trucks of which there are several on the market. Their function in hauling ready mixed concrete is to eliminate any segregation of materials that is apt to occur, to maintain a workable and plastic consistency without necessitating the addition of more mixing water at the job and to facilitate dumping, making picking and shoveling unnecessary at the time of discharge.

Trucks used for hauling concrete may be classified into three groups:

(1) *Flat Bottom Type*—With this type it is difficult to handle concrete having a slump greater than 3 to 4 in. for over a mile or two without causing segregation and compacting. (Special designs of flat bottom truck bodies are being developed to overcome these difficulties.—Editor.)

(2) *Special Body Type*—In this group are several designs, all of them planned either partially to eliminate segregation and compacting or to remix the concrete during discharge. Here, too, for successful service, the concrete must be of a fairly dry consistency, and thoroughly mixed.

(3) *Agitator Type*—There are several types of trucks on the market designed to provide constant agitation in transit. Most of them are capable of handling concrete of any consistency although in some a certain amount of difficulty is encountered in dumping the drier mixes.

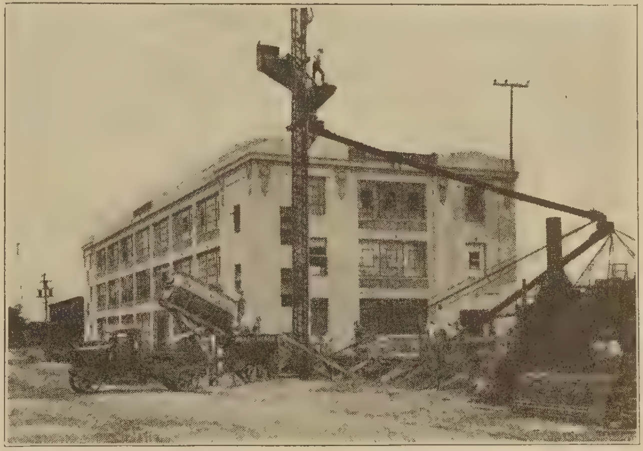
Paving concrete, designed with a slump not to exceed 2 in., can be delivered satisfactorily in almost any truck. When concrete of the consistency ordinarily used in reinforced work, with a slump of about 6 in., is hauled any appreciable distance it is necessary to use some sort of agitation to prevent the separation of materials. When the agitator type of truck is employed the hauling distance is practically unlimited.

The length of haul, however, becomes an economic factor, for the cost of delivering ready mixed concrete increases with the distance the material has to be transported. Experience will determine the limiting distances, and adjustments in the price of the concrete may be made accordingly.

Tests on Hauled Concrete

Specifications frequently include a limit between mixing and time of placing concrete. Ordinarily this is 30 to 45 minutes. On rare occasions it is placed at 1 hour. This limitation is intended to assure a good quality of concrete in the work. Therefore, instead of setting a definite time between mixing and placing of ready mixed concrete, the stress should be laid on the quality. Specifications should state that all concrete should be thoroughly mixed when delivered to the job and be in a plastic and workable condition without segregation. A time limit on the placing of concrete mixed at the site is not often a restriction, but with central mixing plants it may prove a serious hardship, especially in cities where the loaded trucks must pass through heavy traffic sections. The results of tests as indicated in "Public Roads" for December, 1921, and September, 1928, as well as other references indicate that the quality of concrete is not impaired by hauls up to 25 miles in distance or three hours in duration, provided that the material is delivered in a workable condition and will not need additional water to facilitate its handling.

Truck bodies should be washed after the delivery of each load. When the inside of the truck is clean and smooth, concrete will dump easier than if little or no attention is paid to keeping the body in this condition. An ordinary garden hose and city water pressure are usually sufficient for the purpose. Oftentimes in washing truck bodies, cement and fine material are carried into the drains where they will harden and clog the sewers. To avoid this, it is desirable to run the wash water through a sand filter. The installation of a box filled with sand 2 or 3 ft. deep through which the water from the wash rack can pass before entering the city sewerage system will prevent trouble from this source. It is a comparatively easy matter to keep fresh sand in the filter, while on the other hand it is troublesome and expensive to clean the sewers after cement has hardened in them.



The Atlantic and Pacific Tea Company's warehouse in the background was built entirely of ready mixed concrete furnished by a central mixing plant

Co-operation and Service

It should be the aim of the central mixing plant owner to advertise his plant as producing a quality concrete, and as being able to service any size job with a dependable product. The water-cement ratio as a basis for making concrete of predetermined strength and quality has been used on many important jobs during the last few years. Its use is continually increasing and more architects, engineers and contractors are requiring it for their work.

The success of a ready mixed concrete plant is governed largely by its ability fully to co-operate with contractors. It is the problem of the plant owner; first, to have a sufficient number of trucks so there will be no serious delays at the plant due to the trucks all being out on the job; and second, to furnish concrete to the contractor at the time he wants it, causing him no inconvenience on account of delays in deliveries. It is better to turn down certain contracts and keep the good will of those who are buying ready mixed concrete than to try to service too many jobs in a single day. The establishment of good will between the central mixing plant and the contractor who is using the product is an important feature toward building up business and securing future orders.

Many operators find it advantageous to establish a definite schedule of prices for different classes of concrete. An established price, with small discounts for large quantities and prompt payment of invoices would seem to be the most satisfactory arrangement. A suggested schedule cannot be given because of the varying local markets. A price at the plant in one city for a certain class of concrete might change to twice that amount in another locality.

Hauling costs can be computed on the basis of established zones which each plant must work out for itself. For example, at one plant in a large city charges for transportation include a five-mile free haul with a 20 cent charge per yard mile for overhaul. In a medium sized city prices are quoted with a two-mile free haul and a 25 cent charge per yard mile for overhaul. In still another city one company operates on the basis of a fixed price at the plant and a 30-cent charge per yard mile. Another plan used is a definite schedule of prices for concrete at the plant, plus a seventy-five cent delivery charge for the first yard mile, fifteen cents for the second, and ten cents for each additional yard mile. Where there are rough pavements or many steep grades delivery zones cannot be based upon distance alone, but must also take into consideration the physical layout of the community. A condition might exist that would make concrete cost more one-half a mile from the plant than it would at another site two miles away.

Capital Required

Capital required to start a central mixing plant depends on the type and size of plant and the trucking equipment. Small plants have been built for as little as $20,000 while others have started business on $40,000 to $50,000. One equipment company estimates that $100,000 is the necessary capital required to finance construction of a medium-sized plant. A large plant may represent an investment of as much as $450,000 or $500,000. It might be fair to state that transportation equipment for the medium and large-sized plants represents from 50 to 70 per cent of the total cost. This cannot be set down as an invariable rule, but it does indicate the amount required for this division of the business.

Due to the wide variety of trucks now used to haul concrete, prices vary from approximately $1000 for the simplest type of small capacity to $8,000 or $9,000 for the heavier types of special design and greater capacity. One concern has 86 trucks operating while another has 64. Several large plants use about this number to handle their business. Some of the smaller companies have only 4 or 5 of the light-weight trucks to take care of their deliveries.

The number of men required to operate a central mixing plant differs according to the design of the plant. Usually there is a plant superintendent, a mixer man, a plant office man, a helper to load trucks, two or three men for handling cement, one or two laborers, and an operator for the derrick or hoisting equipment. Besides, there are truck drivers, and if the plant owns a number of trucks, one or two garage mechanics. Sometimes a night watchman is employed.

The average radius of haul is another varying factor in connection with the operation of a central mixing plant. Some plant owners in the smaller cities find that three or four miles is the limit for deliveries. Others deliver concrete on an average of 5 to 8 miles. Still others have transported concrete as far as 20 miles. Transportation costs then, must be computed for each plant before an economical maximum haul can be established.

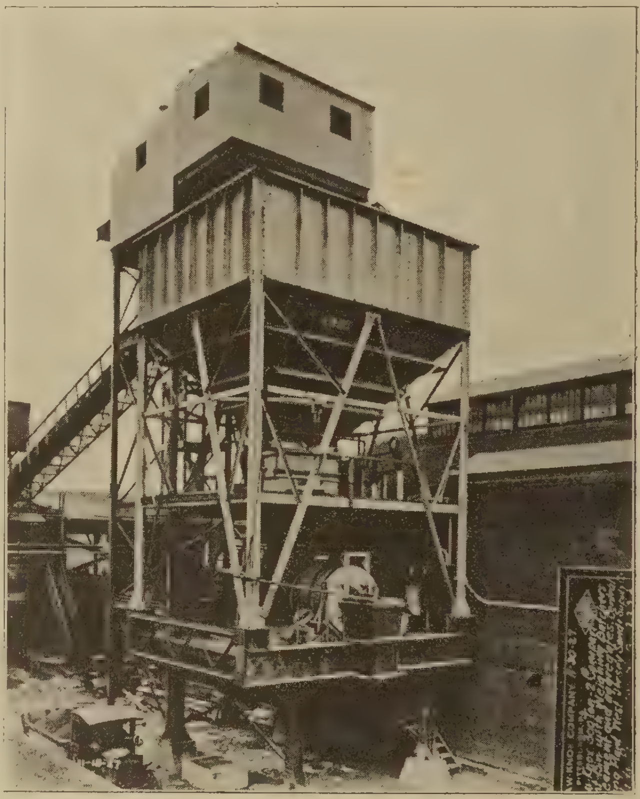
Many companies have special sales organizations to secure orders, while others depend upon friendly acquaintance with builders. One plant doing a fair business added a special salesman and in less than six weeks increased the average daily output from 200 to nearly 300 cubic yards. With a business as new as that of the central mixing plant, sales efforts should be well worth while both for producing immediate results and for advertising features in the use of ready mixed concrete which will pave the way for sales.

Because of the similarity to central mixing plants, mention should be made of central proportioning plants operating truck mixers. Some ready mixed concrete plants operate truck mixers in connection with their regular business.

The cost of truck mixers per yard of capacity is greater than trucks used in the ready mixed concrete business. However, with truck mixed concrete the stationary mixer and its maintenance are eliminated. Which method of furnishing mixed concrete will have the greatest development is a matter that only time coupled with future progress in the production of this class of concrete can tell.

Conclusion

In conclusion, the points in favor of using ready mixed concrete are: (1) The responsibility for proportioning and mixing all concrete is placed in the hands of one man. This usually results in greater uniformity than is obtained in the field. (2) The permanency of the central plant allows the use of equipment to measure accurately quantities of materials that go into each batch, thus controlling the quality of concrete. (3) Mechanical equipment reduces labor costs to a greater extent than is possible under job methods. (4) The contractor is relieved of the necessity of setting up and maintaining a concreting plant. (5) Storage facilities for aggregates and cement, often difficult to provide in congested districts, are not required. (6) The hauling away of concreting equipment and excess materials after the completion of the job is eliminated.



One of the two plants operated by the Chas. Warner Co. of Philadelphia. Note the weighing equipment and the scales on the charging floor

Two Products Convention Papers

Abstracts of Three Ten-Minute Papers Presented at the Wisconsin Concrete Products Association Convention—What of the Small Factory—From the Bottom to the Top

What of the Small Factory?

By W. G. RATHKE

The past ten years have seen an amazing change in business organizations and practices.

It has been a decade of consolidation and mass production which in totals of figures reaches amounts that are truly staggering. No single industry has alone been identified with this modern trend but all business seems to be seeking to consolidate and co-operate with the idea of bringing a greater efficiency to its operation, and, of course, realizing greater profits.

With these changes taking place so swiftly and industries becoming bigger and bigger, the small manufacturer and retailer must often wonder when he will be either gobbled up or flattened out by the steam roller of progress because of inability to meet the prices of his competitors.

Sentiment cannot enter into it. The mere fact that a small business has been established for many years in a community will not offset the fact that a new competitor only in business for a year is able to sell his product at a lower price.

What then is to be the outcome of this modern trend? Does it mean that the small manufacturer is ultimately to lose his individuality and his accumulation of years because he is not able to face his problem squarely and apply the proper remedy?

In our line of business we have often heard the question asked as to whether or not the small concrete products manufacturer—in competition with plants in the so-called millionaire class—can hope to survive.

Collectively these small plants represent a very large investment on the part of owners. In its small way each plant contributes much to the welfare and happiness of the community in which it is located. Livelihood is furnished for a number of families and taxes are paid to local governments.

There is no good reason why a products plant with an annual production of 100,000 units or slightly in excess of that amount cannot make a fair return on the invested capital. In order to do this, however, there must be correct plant design, efficient machinery, conservative and good management and above all a quality product must be made which will pass all tests that might be required of it. It would be out of the question to attempt to compete with the large plants with an inferior article.

How the Small Plant Can Succeed

We must have correct plant design. It is obvious that a small factory cannot maintain its existence unless every advantage is taken of the possibilities to eliminate labor in the manufacture of products to the end that the cost per unit will be kept at a minimum. We can copy from the larger plants and utilize in a smaller way every labor saving device which has proven itself and accomplishes the result required. We cannot hope with hand methods or the use of obsolete machinery to be able to compete successfully with these large plants in turning out a product of uniform quality and at a price at which it can be sold profitably.

With correct plant design it is a fact that two men can easily do all of the operations necessary in the making and yarding of over 100,000 units, in an operating season of ten months, while under old fashioned and obsolete methods four and five men would be required daily.

Simple and efficient machinery must be provided. It would certainly be a mistake for a manufacturer to purchase a machine with a capacity of a million units and its resultant large investment when living adjacent to a market which can only absorb 100,000 units.

A good machine with a rated capacity of 900 to 1000 block per day, which is simple to operate, is all that would be required in such a case and it is reasonable in price. It is easier to add another machine later, should business warrant it, out of the profits resulting from good management in keeping the original investment to its proper level.

The manufacturers and our various associations have a wealth of material available both on plant design and machinery which can be had on request. It is to our advantage to make use of these facts and apply them to our individual needs. It always costs money to experiment with untried methods.

Proper attention must be given to aggregates and mixing. In the last few years great strides have been made in this regard, which changes all our previous standards of manufacture and enables us to make more units per sack of cement and at the same time get a better test.

This information is also available to the small plant and it is able to regulate the mixture of aggregates in the same scientific way as is the large plant. Aggregates should be segregated according to the different sizes. With this method it is easily possible to find the mixture which works efficiently and gives the most units per sack of cement. There is no secret about this and the small plant can operate as efficiently as the large plant in this respect. The small operator must take advantage of every chance offered to reduce costs as only in this way can competition be maintained with the large plants equipped with research laboratories which are constantly making every effort to find new ways to reduce their costs of manufacture and distribution.

Efficient Management Needed

Then we must have conservative management of the small plant. It is apparent that overhead expenses will have to be curtailed as receipts from the business will not warrant the expenditure of excessive amounts for plant superintendence, sales, advertising, etc.

The manager of a small factory will obviously have enough time to superintend the operation of the plant and promote the sale of products manufactured. By the use of daily production reports, made out by the workmen, it is very easy to keep a check on the cost of units made each day and any serious discrepancy can be promptly rectified.

Personal contact with the customer and giving service will tend to create a good-will which will constantly reflect in increased business. We should interest ourselves in our customers. The fact that one purchase of units for a basement or small building is all we may ever receive from a customer will not excuse slipshod methods of delivering these units to him. We should call on the job and assure ourselves that deliveries are being properly made and that units are being placed so that walls can be laid up with a minimum of labor. If carelessness has caused any spoilage it should be adjusted at once. A list of satisfied customers will go far to offset advantages which large plants may seem to have, but who are so big that they cannot get in personal contact with all of their trade.

Accurate cost records must also be kept by the small manufacturer. It is more necessary for the small operator to scrutinize each expense carefully so as to eliminate all unnecessary items. Records should be kept so that comparison of expense can be made with other years so as to note savings accruing to careful management.

The manager of the small factory should carefully study his business and become intimately acquainted with all its phases. New methods are constantly being brought forward and can be applied to his plant when resulting in lower costs or a better article at no increase in cost.

If proper attention is given to the costs of operation of a small factory in all departments there can be no reason why the concrete products plant with a limited production cannot actively compete with the large plants and at the same time enjoy a reasonable return on the invested capital.

The question of the number of block that can be turned out in an efficient plant per man per day was again raised in the discussion that followed the presentation of Mr. Rathke's paper. Here, also, there was much difference of opinion, some manufacturers contending that a production of 250 block per man per day was all that could be hoped for. Instances were cited, notably by Jack Franklin, where records far in excess of this had been and are being made. He cited one plant where 4 men make up to 2400 block per day—a production of 600 block per man per day.

From the Bottom to the Top

By ART DEVOS

Concrete roofing tile is not a new, untried product, since it has been successfully used in Europe for 80 years and in the east and far west of this country for the past 10 years. We manufacturers of concrete products can tell the world that we can furnish the material to build a fireproof building of concrete "from the bottom to the top."

The first essential in the making of concrete roofing tile, as in other concrete products, is the selection of the quality and grade of sand, in order to obtain the necessary strength of tile. An ideal sand should contain about 10 per cent of grits passing a ⅛-in. mesh and be uniformly graded down to the finest sand, with a slight excess mixing of fine. Another essential is that of color. In the early days much cheap red mortar color was used with disastrous results. The cheaper red oxide often contained upwards of 50 per cent of impurities and some of these, being soluble, leach out on the surface of the tile; others oxidize on exposure and leave black stains. The tile produced 8 or 10 years ago has now almost entirely lost its color and remains a dull cement gray, slightly stained with red.

In the selection of color pigments, it is not only important that they be pure, but also that they should not contain elements that react with the alkalies in the cement and change the color.

Many colors on the market are not proof against alkali reaction, and some are those containing lead or cadmium with the alkalies in the cement to form salts which will not combine with the cement but are deposited in the form of fine powder on the surface of the tile, that can be brushed off with the fingers.

The method of coloring by hand consists of mixing dry cement and color ground together and sprinkled over the surface of the newly formed tile while wet and rubbing it in with a steel trowel so that the moisture of the cement, which should be very plastic, will penetrate the color and thereby make a thorough bond.

It is not practical to steam-cure tile while they are still on the pallets, but the tile should be kept at a temperature of about 60 degrees for the first 24 hours, at which time they are hard enough to be removed from the pallets and stacked on edge. They should then be placed in a curing room, cured in warm air and sprinkled once a day for two or three days. When the curing period is over the curing room should be allowed to slowly cool down to outside temperature before the tile are moved. They should not be brought suddenly into the open air.

It is probable that this method of treatment prevents any evaporation from the surface until the surface has hardened, and small capillaries are not formed by evaporation from the top surface as they would be if the tile were suddenly dried. This reduces the possibility of evaporation through the top surface and results in most of the efflorescence being found on the back of the tile where it does not show.

Preventing Efflorescence

Efflorescence can be checked not only by care in curing but also by the selection of clean materials and by care in making the top surface of the tile denser than the base. Efflorescence is a serious problem in the roofing tile plant since a small amount of efflorescence is far more conspicuous against the intense colors of the tile than it is in trimstone of less vivid hues. Efflorescence is due to the presence of soluble alkalies in the concrete. These are drawn to the surface by evaporation after the tile has been wet and are deposited on the surface and eventually washed off by rain. The amount of alkali in the thin section of the tile is not very large and even under worst conditions it disappears in two years at the most, and in most cases three months' exposure to the weather is sufficient to remove it. Efflorescence can be largely controlled by extreme care in curing. It is important that the newly formed tile should not be subjected to sudden changes in temperature and should not be allowed to dry out before they are thoroughly hardened.

The steel or cast iron pallets on which tile are made have to be oiled in order to prevent concrete from sticking to the pallets. Some manufacturers have used crude oil for that purpose, but as the concrete absorbs some of the oil, this practice is not satisfactory. The sulphur compound is drawn to the surface and there oxidized, causing black stains which disfigure the surfaces of the tile. The only lubricant that has been found satisfactory is a mixture of tallow and kerosene, which gives very good results.

Most roofing tile has a thickness of ⅜ of an inch, and as they are made without reinforcement it is very important that they should be of maximum hardness before shipment, as otherwise they are subject to considerable breakage. The tile should be kept in storage for at least 30 days after curing, in warm weather, and for 60 days or more in cold weather.

Concrete Pavement Maintenance

A Discussion of Those Design and Construction Features That Affect Maintenance Costs—Early Maintenance Helpful—Joint Construction—Maintaining Joints and Cracks—Surface Irregularities—Replacements

By LEE S. TRAINOR

PROGRESSIVE and far seeing highway departments of states, counties and cities are agreed upon the necessity of practical, intelligent maintenance of all pavement surfaces. The technique of surface maintenance on concrete pavement has not been completely standardized and it will not be the purpose of this paper to discuss the subject, except as it may be influenced by those features of design and construction which bear upon the life-durability and satisfactory use of the pavement.

Early and proper curing of concrete pavement exerts a profound influence upon the life and durability of the pavement which is reflected in reduced necessity for surface maintenance.

Careless joint construction is responsible for a large part of the maintenance required on concrete pavements. Be sure that the pavement is exactly at the same level on both sides of the joint when it is built

Curing which promotes complete hydration of the cement in the mass is accomplished by providing favorable conditions, either by replacing water that has been lost through evaporation or by sealing the surface of the pavement to prevent such loss. Several materials and methods of curing are available, the most recent developments being in the field of surface coatings designed to prevent the loss of moisture by evaporation.

Next in order of importance to curing is early maintenance, again proving the old adage, "A stitch in time saves nine."

During the past year field observations have been made on a large mileage of concrete road pavements to determine their present physical condition under various conditions of traffic and service taking into account climatic conditions, subgrade, materials and methods used in construction, etc. While reports covering these studies have not been completed many significant indications have been already developed.

Among these developments and applying specifically to work in the northern states will be found indications of necessity for thorough study of aggregates proposed for use in concrete pavement construction to determine their soundness under alternate freezing and thawing.

Joint Construction Important

There is also evidence tending to establish the necessity for more complete understanding of details of placing expansion and other joints in the pavement. In one study 40 per cent of the expansion joints used in the original construction were found to be defective principally through careless construction. The joints were:

(1) Not vertical.

(2) Did not extend through entire thickness of pavement.

(3) Did not extend entirely across the pavement.

(4) At intersection of compressible and non-compressible joint, the compressible joint filler did not extend continuous across non-compressible joint.

All of these defects which contribute so largely to the surface maintenance required on the pavement should and can be totally overcome by proper installation during construction.

Care should be exercised to prevent foreign materials of a solid nature from becoming lodged in the space to be occupied by the joint filler and all such materials should

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A paper presented before the Eighth Annual Meeting of the Highway Research Board.

be removed before joints are refilled with bituminous material during maintenance operations.

The application of bituminous materials to the outside edge of the pavement slab at the outer ends of expansion joints has been found to be effective in preventing foreign materials from entering the expansion joint from the side. This result is most easily accomplished by removing shoulder material at the ends of all joints for the full depth of pavement slab and inserting sheet metal or other suitable form to mold a section of bituminous material about 1 inch in thickness and from 3 to 4 inches in length for full depth of the pavement slab. After the bituminous material has cooled the form may be removed and shoulder material replaced.

Misplaced Materials

It was noted in several instances that short longitudinal cracks in the pavement originated at transverse expansion joints and investigation established the fact that solid materials were imbedded in or were occupying part of space intended for compressible joint filler and when pavement came into compression excess stresses were set up at these points resulting in the formation of longitudinal cracks.

The unsatisfactory conditions resulting from non-vertical joints and uneven height of concrete on opposite sides of expansion joints are too well known for discussion here.

The conditions existing at the intersection of compressible and non-compressible joints as observed in the field indicates the necessity for more careful attention to details of construction at these points if maintenance costs are to be held at a minimum.

It was found that in many cases compressible joint filler was cut or short sections omitted to permit installation of continuous section of non-compressible joint material resulting in conditions favorable to spalling and as a consequence requiring additional attention and expense for maintenance at these points.

A good rule to follow would be "Compressible joint filler shall be so installed as to provide continuous strip across full width and depth of pavement and shall be continuous across all joints where no compressible filler is used."

Concrete adjacent to all joints should be rounded by use of appropriate edging tool to prevent chipping.

The replacement of bituminous materials that may be lost from expansion joints under service conditions and the filling and sealing of cracks and breaks that may occur in concrete pavement constitutes the major maintenance activity common to the pavement structure.

Maintaining Joints and Cracks

All cracks and joints should be thoroughly cleaned and old filler and other foreign substances removed before new filler is applied. Steel rods with curved sharp points will be found useful in removing imbedded material from cracks and joints. Small hand bellows are useful in blowing dust and other fine materials out of joints. A hose attached to the exhaust pipe of an automobile may be similarly used and some highway departments employ a small portable air compressor mounted on an auto truck for this purpose.

A hot shovel may be employed to remove excess filler after joints and cracks have been filled. This procedure not only produces a more sightly appearance but conserves filler material, and improves the riding qualities of the pavement.

Asphalts and tars predominate as materials for use as crack fillers. However, there are wide differences of opinion among highway engineers as to the relative merits of these two materials as well as many variations of each, which condition suggests the necessity for well directed research in this field.

Specifications for bituminous joint and crack filler have been prepared by A. S. T. M. (Tentative Standard D-102-24 T) and by A. S. M. I. (Page 496, proceedings 31st Annual Convention, 1925-1926). However, neither of these specifications seems to meet with universal approval.

Intelligent use of planes of weakness or dummy joints both longitudinally and transversely has eliminated much if not all intermediate cracking with its attendant call for maintenance.

Introduction of Weakness Planes

Planes of weakness may be produced by inserting at the time of construction continuous metal or other noncompressible strips set vertical and extending from subgrade to or near the top surface of the pavement or the same effect can be secured by building the pavement part at a time, using properly spaced construction joints for this purpose.

Dummy joints are formed by pressing or inserting into the surface of the pavement (while plastic) a thin metal strip about ¼ to ⅜ inch in thickness and from 2 to 3 inches wide, which strip is later withdrawn, leaving an indentation in the surface of the pavement which is later filled with bituminous filler.

Surface Irregularities

Approved modern construction practice does not tolerate surface irregularities greater than ¼ inch in 10 feet and an increasing number of engineers are demanding a maximum tolerance of ⅛ inch to 10 feet. When surface irregularities greater than the maximum tolerance are encountered they should be removed before concrete has hardened if detected in time, otherwise they may be ground down by a power driven grinding machine especially constructed for this purpose.

The prompt reduction of surface irregularities will produce a better riding surface with longer life and satisfactory performance at considerable reduction in maintenance costs.

Replacements due to structural failure, surface cuts, or other causes are most satisfactorily made with concrete and in those locations where minimum closing to traffic is desirable. High early strength concrete may be employed with satisfactory results. In making replacements of this nature the area to be replaced should be as nearly square or rectangular as possible, avoiding acute angles and the sides of the remaining concrete trimmed as nearly vertical as possible for at least 2 to 3 inches down from the top surface of the pavement.

Use Water-Cement Ratio

Low water-cement ratio concrete using a relatively stiff consistency should be employed in making replacements and all new concrete should be thoroughly rammed and tamped into place, repeating the tamping and ramming at intervals for 45 minutes or more, adding new material if necessary, to completely fill the space. Care should be exercised to make sure that new concrete is in intimate contact with old material after initial shrinkage has taken place. Normal portland cements may be employed to produce high early strength concrete with entirely satisfactory results.

In cold weather all materials entering into concrete replacement work should be heated to from 70 deg. F. to 90 deg. F., and provision made to retain heat in the replacement area until concrete has hardened.

Reinforced Concrete Design Simplified

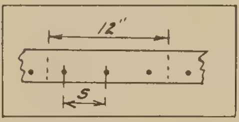
Chart J—Choice of Steel for Slabs

By PROF. JAMES R. GRIFFITH
Armour Institute of Technology; Assoc. M., A. S. C. E.

Joint Committee Specifications

$f'_c =$ 2,000 lbs. per sq. in.
$f_c =$ 800 lbs. per sq. in.
$f_s =$ 18,000 lbs. per sq. in.
$n = 15$

$$S = \frac{12\,a}{A_s}$$



WHEN designing reinforced concrete beams, the proper number of bars is figured from the total area of steel required. This problem was solved by Chart C.

As explained under Chart I, a reinforced concrete slab is figured as a series of beams of 12-in. width. Chart I gave the necessary area of steel for each 12-in. width of slab. It would be possible to obtain from Chart C a combination of bars for each 12-in. width of slab which would satisfy the requirements. The 12-in. width of slab may be taken at any place since it represents a typical width. The surplus of steel made necessary by the use of Chart C would be uneconomical in the case of slabs. Therefore, a bar size is assumed, in the case of a slab, and spaced at such intervals that any 12-in. width will have the required amount of steel. Chart J has been designed to solve this problem and give the spacing.

Chart J Application

A slab problem was solved, under Chart I, in which 0.475 sq. in. was found to be the necessary area of steel for each 12 in. of slab width. A straight line, Chart J, from the necessary steel area through the assumed bar size will give on the right hand scale the necessary bar spacing. Isopleth (1) has been drawn for a 3/8-in. round bar, giving a spacing of slightly more than 2¾ in. Isopleth (2) has been drawn for a ½-in. round bar, giving a spacing of slightly less than 5 in.

The foreman marks, on the forms, the location of each bar of steel. For that reason it is customary to specify the spacing by ½-in. intervals, although a spacing by full inch intervals is to be preferred. Thus, in the above example, a 2½-in. spacing would be used for 3/8-in. bars, or a 4½-in. spacing for ½-in. bars. Isopleths (3) and (4) show for these combinations the actual steel area for each 2-in. width of slab and indicate that the ½-in. round bars are slightly more economical than the 3/8-in. bars. Using the ½-in. round bars will give a steel area of 0.522 sq. in. per ft. of slab.

Practical Considerations

When the location of steel reinforcement is specified, provision should be made for keeping the steel in that location while the concrete is being poured. Temperature steel, so-called, is usually specified in thin slabs to care for the shrinkage stresses and prevent cracks. Since the temperature steel runs at right angles to the main reinforcing, when wired together, each acts as a spacer to the other.

If the slab reinforcement is designed to be 1 in. from the bottom, some means should be used to assure that the concrete will set with the steel in this location. On many jobs the steel is placed on top of the slab forms and the concrete poured. After the concrete has had a chance to set a slight amount a workman lifts the steel, with a hook, to what he thinks is the proper location. Some contractors will better this method by placing rocks under the steel to hold it in the approximate location. Best of all is the commercial chair. There are various chairs on the market, usually of light stamped metal, or wire, which hold the steel reinforcement in place. Probably the best arrangement is a combination chair and spacer.

There are available several types of welded fabric and triangular mesh reinforcement. These have light cross members to act as spacers and assure more accurate spacing of steel.

Construction of Chart J

The bar spacing, distance between bars, will be represented by (S), Fig. 1-J. The number of bars (N) in any 12-in. width of slab will then be

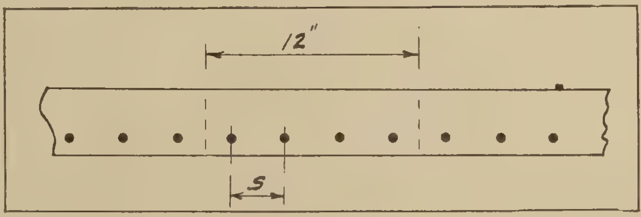


Figure 1-J

$$N = \frac{12}{S}$$

The total area of steel (A_s) in any 12-in. width of slab will then be the product of the number of bars and the area (a) of each bar.

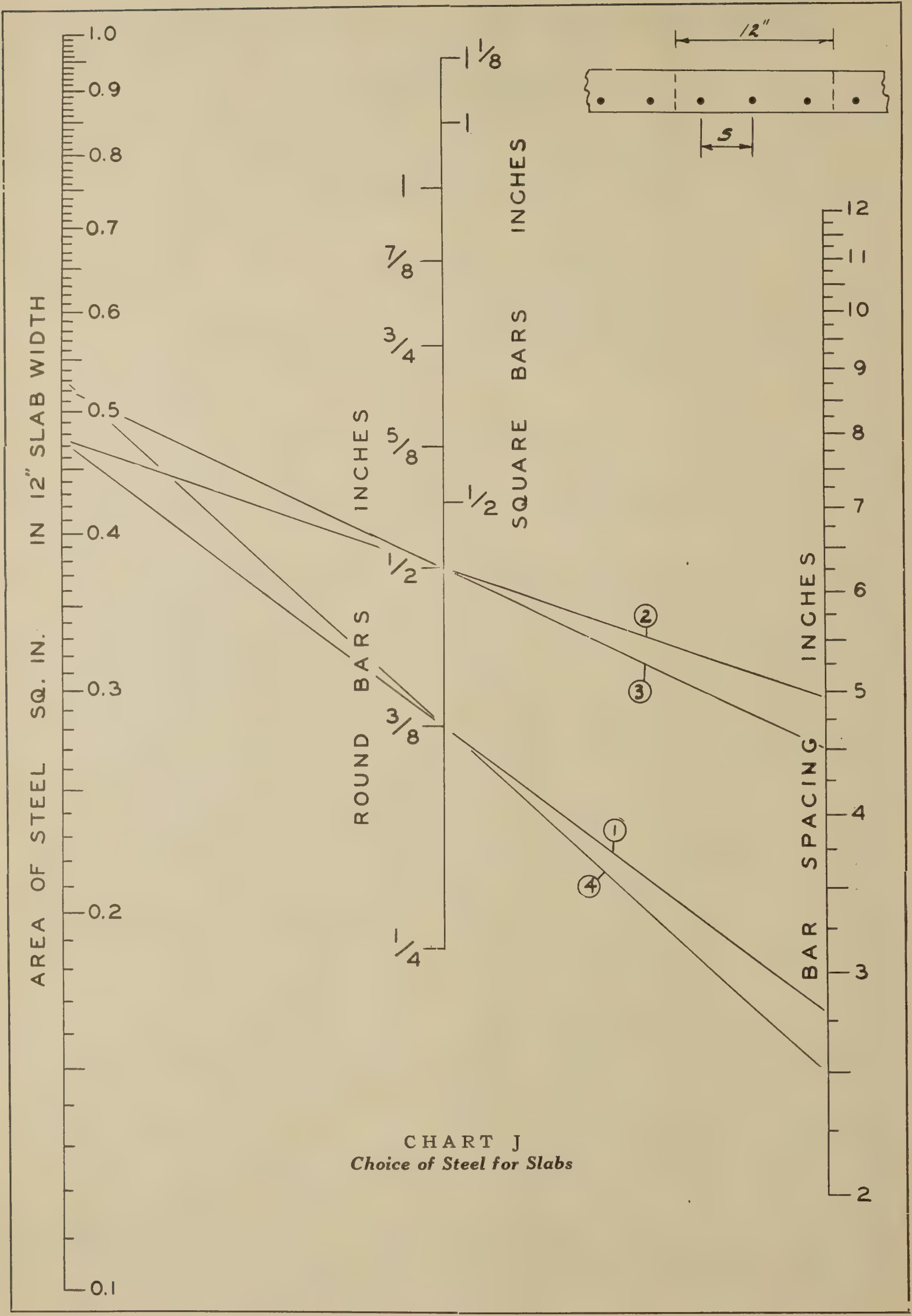


CHART J
Choice of Steel for Slabs

$$A_s = N a = \frac{12\,a}{S}$$

Transforming this expression, we have

$$a = \frac{A_s\,S}{12} \qquad \text{Eq. 1-J}$$

a = area of each bar, sq. in.
S = bar spacing, inches.
A_s = total area in 12-in. slab width.

Eq. 1-J corresponds to the general expression, Eq. 7, requiring logarithmic co-ordinates for nomograph construction. Values of (A_s) will appear on the left scale,

$$C = L^{mn/r} \cdot R^{m(1-n)} \qquad \text{Eq. 7}$$

values of (S) on the right, and values of (a) on the central scale. Using the D-10 scale for the (R) and (L) scales, the ratio (r) will be

$$r = 1$$

Equating the actual exponents of the variables in Eq. 1-J to the general exponents of Eq. 7, we have:

$$\left.\begin{array}{r} \dfrac{mn}{r} = \dfrac{mn}{1} = 1 \\ m(1-n) = 1 \end{array}\right\}$$

Solving these two equations simultaneously we get

$$\left.\begin{array}{r} m = 2 \\ n = \dfrac{1}{2} \end{array}\right\}$$

Thus the central scale (C) will be midway between the two outside scales and will require the A-10 scale for its co-ordinates.

Fig. 2-J shows the complete details by which the original of Chart J was constructed. Instead of showing on the central (C) scale the values of (a), the area of the individual bars, only the location of the commercial bars were indicated.

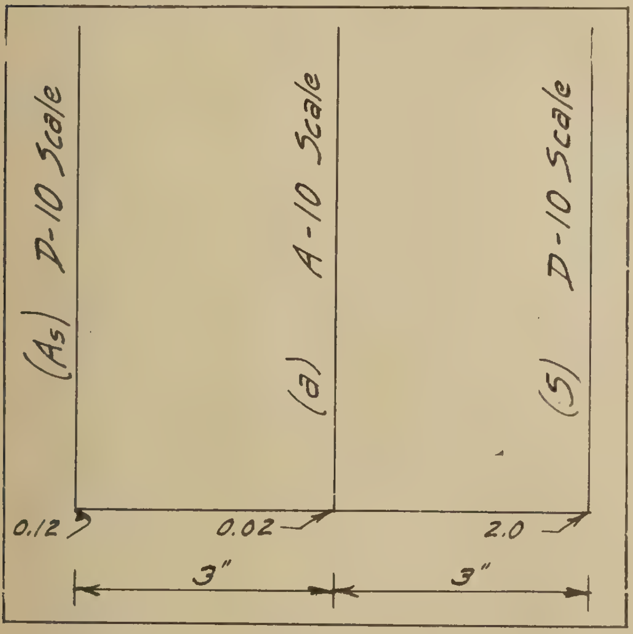


Figure 2-J

University of Wisconsin Gives Mix Design Courses

The University of Wisconsin in January began the first of several short courses to be held in the cities of Milwaukee, Janesville, Eau Claire, La Crosse and Wausau, Wisconsin. A sixth course, conducted entirely by university men, will be held in Madison. Follow-up work in the laboratory is also to be offered at Madison and Milwaukee to all that are interested.

Instruction in the short courses will take the form of lectures and demonstrations at two meetings, featured by as much general discussion and questioning as the time allows. At Madison the speakers will be Professors M. O. Withey, University of Wisconsin College of Engineering, and H. E. Pulver, University Extension Division. In the other cities Professor Pulver and Professor Brevik, representing the Portland Cement Association, will give the work.

The purpose of these short courses is to present, in clear-cut and understandable form, information on the design and control of concrete mixtures, including the water-cement ratio method of proportioning. The proportioning of materials by weight will also be explained.

The courses are intended for engineers, architects, contractors, superintendents, foremen, construction men, and for everybody else interested in concrete work.

The keen interest of concrete men in this type of course is shown by the fact that over 32,000 have attended some 200 such courses in the last few years, given mostly by the Portland Cement Association. Last winter 140 men attended the joint University and Portland Cement Association course held at Green Bay and about 100 the course held in Madison, while the course held by the Association at Milwaukee was attended by more than 300.

The university will follow up this winter's short courses with laboratory work at Madison and Milwaukee, open to all concrete men who are interested in the design, testing, and control of mixtures. The laboratory course at Madison will be given by Professors Withey and Pulver at the University Engineering Building and the Milwaukee course by Professors Pulver and W. J. Fuller at the engineering laboratory of the University Extension Division, 619 State Street.

Among the experiments included in the laboratory work will be the preparation of a "job curve," the designing and testing of concrete mixtures proportioned by the water-cement ratio and weight method to have a desired strength and workability, laboratory tests that would ordinarily be made on concrete materials (sieve analysis, weight per cubic foot, silt, bulking, etc.), field examination of aggregates, and the design of mixes for concrete of high early strength. No mathematics beyond arithmetic is required.

The laboratory work will be given one evening a week for six weeks.

Other information may be obtained from the University Extension Division, Madison, Wis.

Coming Conventions

American Concrete Institute—February 12th to 14th. Twenty-fifth annual convention, at the Book-Cadillac Hotel, Detroit, Mich.

American Concrete Pipe Association—February 14th to 16th. Annual convention, at the Book-Cadillac Hotel, Detroit, Mich.

Association of Cast Stone Manufacturers—February 13th. First annual meeting, at the Book-Cadillac Hotel, Detroit, Mich.

National Concrete Products Association—February 11th. Annual convention, at the Book-Cadillac Hotel, Detroit, Mich.

Painless Bookkeeping For Products Plants

The Fifth Article of a Series on a Simplified Method of Keeping Products Plant Records

By F. W. SCHNOEBELEN

Part V—Accounts Payable and Disbursement Record

Having opened the books of the new, hypothetical Standard Block Corporation, as described in the January issue, we are now ready to proceed with the actual recording of the transactions that take place.

The first record form to be studied is the Accounts Payable and Disbursement Record which is illustrated and described in this installment. In order to gain a thorough understanding of this form and the method of recording transactions on it, it may be necessary for the reader to refer back to the December installment in which the bookkeeping principles involved are explained in detail.

The next article will deal with the Detailed Cash Book and the Sales Register.

MOST business, today, is conducted on a credit basis. That is, credit transactions in which merchandise or some other property is purchased or sold on account, are common procedure. When merchandise is purchased by the business, it is usually referred to as a "credit purchase"; when sold, a "credit sale."

In this article we will make a study of the Accounts Payable and Disbursement Record. This is a record of all charged items, or in other words, it is a record of the indebtedness and incurred liabilities of the business. Exhibit E is an example of one of the Accounts Payable and Disbursement Record pages. This journal, when the entries are properly recorded, will show in detail the amount that is owed for the purchases of individual materials and the amount of the various expenses. A minimum amount of time and effort is needed to make the entries. As stated in an earlier article, a knowledge of the law of debits and credits is necessary, for it is a double entry method. When we credit one account we must also debit another account.

The Form Explained

Before we go over the entries on Exhibit E in detail, an explanation of the columnar headings is in order, to familiarize ourselves with this particular form. The form illustrated is not necessary. Any columnar book can be headed and used in the same manner. To make the entries more easily, the first requirement is that all the lines should be numbered on each side of the sheet. In the date column, we write in the day that we incurred the liability or received the invoice, while in the invoice column we write the number of the creditor's invoice, if any. In the creditor column we write the creditor's name if it is carried in the Accounts Payable Ledger or any other notation that may be of value in making the entry more understandable. If any item has been paid, which is handled through the Detailed Cash Book, we write the check number in the Check Number column opposite the transaction in question.

Under the main heading—Credits—we have two columns, one for Accounts Payable and the other for the General Ledger. The Accounts Payable column represents the amount the business owes and it is an account in the General Ledger. The General Ledger column lists the individual amounts that are credited directly to the General Ledger. The entries are made in the General Ledger column because these entries can not be distributed under any other of the columns which generally consist of accrued items. In the Account column we list the accounts that are affected by the transactions, either General Ledger, Accounts Payable Ledger, or Expense Ledger. The following column is the debit General Ledger column, where we enter those amounts that are debited to General Ledger accounts, that is, items that cannot be distributed to the purchase of materials or expenses. The next three columns are debit columns in which the amounts of the purchases of raw materials are recorded. We enter the amount of the purchase plus the freight or any additional item that increases the cost of the material in these columns. The Direct Labor column is used to enter the total amount of the pay roll applying directly to the manufacturing of the product. That is, we enter all pay roll, except that spent for delivering, selling or administrative work.

The following four columns, Manufacturing, Delivering, Selling and Administrative, and Financial are expense control accounts in the general ledger and represented in detail by the accounts in the Expense Ledger C. This simplifies our expense into the four major parts in the general ledger, instead of dozens of expense accounts. If we wish the detail expense of any of these major expenses, we have it in the Expense Ledger. We will note that by using this form it reduces the general ledger accounts to a minimum, which simplifies it for information and balancing.

We are now ready to take up the detailed entries in Exhibit E. As mentioned in a previous article, the entries will be by character, rather than by individual transactions. The first entry on line 2—the purchase of cement—would then be made up of several bills received for cement during the course of the month and from various vendors which, of course, would be entered separately. Each individual bill then would be treated in the same manner as cement. However, only the total amount of each bill is necessary in the Accounts Payable column,

EXHIBIT E

THE STANDARD BLOCK CORPORATION

ACCOUNTS PAYABLE AND DISBURSEMENT RECORD

Exhibit-E

	Date	Inv. No.	Creditor	Paid By Check No.		Credits		Account	Debits									
						Accounts Payable	General Ledger		General Ledger	Purchases.			Pay Roll Direct Labor	Expenses – Control Ledger C.				
										Cement	Sand & Stone	Miscell. Material		Manufact.	Delivery	Selling	Adminst. & Finance	
1			Brought Forward –															1
2			Name of Vendor			960.00				960.00								2
3			" " "			940.00					940.00							3
4			" " "			110.00						110.00						4
5			Railroad Co.			300.00				300.00								5
6			Notations			1025.00		Accrued Pay Roll-1 wk					900.00		125.00			6
7			"			175.00		Indirect Labor						175.00				7
8			Name of Vendor			70.00		Heat, Light & Power						70.00				8
9			" " "			30.00		Maintenance Machinery						30.00				9
10			" " "			10.00		Supplies						10.00				10
11			" " "				25.00	Insurance Accrued										11
12			Notations - Estimated					Insurance						25.00				12
13			" 20% Mo. $9000. Yr.				150.00	Resr. Depreciation F.										13
14			"					Depreciation Mach.						150.00				14
15			" 2% Mo. $12000. Yr.				20.00	Resr. Depr. B										15
16			"					Depreciation Bldg.						20.00				16
17			" Estimated 1 Mo.				40.00	Accrued Taxes										17
18			"					Taxes						40.00				18
19			Name of Vendors			325.00		Cartage							325.00			19
20			Notations			110.00		Auto Expense							110.00			20
21			" 20% $2400.00 Mo.				40.00	Resr. Depr. Truck										21
22			"					Depreciation Truck							40.00			22
23			Name of Vendors			25.00		Advertising								25.00		23
24			" " "			15.00		Auto Supplies								15.00		24
25			" " "			56.00		Miscellaneous								5.00	51.00	25
26			" " "			575.00		Accrued Salaries								225.00	350.00	26
27			Notations 20% - 600 - Mo.				10.00	Resr. Depr. Car.										27
28			"					Depr. Car - Sales								10.00		28
29			" 10% - 480 - Mo.				4.00	Resr. Depr. Office										29
30			"					Depreciation Office									4.00	30
31			" 10% - Sales. - Mo.				60.00	Resr. Bad Debts.										31
32			"					Bad Debts									60.00	32
33			" Int. Bank Loan + Bond. " 6% on Stock. - $40,000.				270.00	Accrued Interest										33
34			"					Interest									270.00	34
35			"				2000.00	Accts. Receivable										35
36			"					Notes Receivable	2000.00									36
37			Name of Vendors			1000.00		Real Estate	1000.00									37
38			" " "			800.00		Equipment	800.00									38
		1/31	Totals			6526.00	2619.00			1260.00	940.00	110.00	900.00	520.00	600.00	280.00	735.00	

but it must be distributed to the proper inventory or purchase columns. The purchase of sand and stone and miscellaneous material would be treated in the same manner as the cement.

Line 5 represents the freight for the month on cement which, of course, is composed of several freight bills, entered individually in daily transactions. The freight is always added to the cost of the raw materials. It may be entered directly to the cost of the materials as in this case, or a separate account may be kept if many mistakes occur in rendering freight bills. We believe the best policy is to enter it direct, for it reduces the number of accounts in the general ledger.

Accrued pay roll on line 6 represents the amount due for wages. The total amount payable is credited to the Accounts Payable column and part of it, that amount used for manufacturing, is charged or debited to Pay Roll Direct Labor, and part, that amount used for delivering, to Delivery Expense. It must be distributed to expense that is affected by the charge. This, of course, represents the total of the various pay roll periods during the month. The accrued Pay Roll account is balanced when we pay the laborers their wages. The amounts of the individual checks are then charged to the accrued pay roll account. This will be taken up in the Detailed Cash Book. Accrued Indirect Labor on line 7 is handled in the same manner.

Lines 8, 9 and 10 represent the total amount of various bills for manufacturing during the period. We credit accounts payable with the amounts and debit the accounts, Heat, Light & Power, Maintenance Machinery and Supplies in the Expense Ledger, and the Manufacturing expense column, which is the control of these accounts.

At the end of the month we wish to include all our expense in the month's business. For instance, on line 11, we know that we will have to pay for insurance, although we have not yet received a bill. We set up $25.00 as accrued insurance. This is the amount that we owe monthly, based on the previous year's experience. We then charge the Insurance expense account for that amount, which we place in the Manufacturing Expense column, because the insurance covers buildings, machinery and the employees. When we pay the premiums on the insurance, we debit the Accrued Insurance Account for that amount, which balances the account.

In like manner, every month our machinery is gradually wearing out, so must set aside a sum with which to buy new machinery. For instance, on line 13, we take 20 per cent depreciation annually on the machinery investment then, taking the monthly proportion of this, we credit Reserve Depreciation for Machinery and charge or debit the amount Depreciation in the Expense Ledger, which we place in the Manufacturing column. When we purchase new machinery to replace the old, the amount is debited against the Reserve Account for Depreciation. In like manner we treat depreciation for buildings on line 15; depreciation on trucks, line 20; depreciation on salesmen's cars, on line 27; and depreciation on office equipment on line 29. This depreciation, however, is charged against the control expense accounts that are affected. The amount of depreciation to be taken on each item varies with the life of the item. The manufacturer will have to determine his own rate from past experiences. Every manufacturer should maintain the various depreciation on equipment, as in Exhibit E, and should keep them in separate accounts in the General Ledger. Each reveals a separate story.

Line 17 is for Accrued Taxes, which are credited to that account monthly on the same basis as the insurance and are charged to the Manufacturing Expense. Lines 19 and 20 are cartage and auto expense respectively, by which accounts payable are credited and delivery expense debited in the same manner and the same way as the manufacturing expenses. Advertising, auto supplies and miscelllaneous expenses are selling expenses that should have separate accounts in the expense ledger. Accrued salaries are treated the same as pay roll, and should be distributed as indicated to the various control expenses. For instance, salesmen's salary to selling expense and the officers' and clerks' salaries to administrative and financial expense.

Bad Debts

In every business we have certain accounts that are uncollectible. In order not to incur this liability in one lump sum at the end of the year or when the accounts have proven to be uncollectible, it is better to set up a reserve for bad debts. A certain per cent of the monthly sales is usually set aside for this purpose. On line 31, we credited reserve for Bad Debts with 1 per cent of the sales for the month and charged bad debts with the amount as an administrative and financial expense. This then becomes a monthly expense of the business and any account that is worthless is then debited against the reserve account.

Interest on the notes and bonds of the business become due semi-annually, but it is proper to credit accrued interest monthly for the amount and debit the Interest Paid Account, which becomes an administrative and financial expense as in line 33. Then when the interest becomes due, we debit the Accrued Interest account. This balances the account. We also must credit Accrued Interest account with the interest on the preferred stock of the corporation that is to be set up monthly and debit it as an administrative and financial expense.

Lines 35 and 36 are an instance where the business accepted a note from a customer for $2,000.00 to apply on his open account. We simply credit Accounts Receivable and debit Notes Receivable in the General Ledger. We could have shown this transaction in the General Journal as well, but it is shown in this journal to show how versatile the record is.

Line 37 represents an additional piece of real estate that was acquired. We credit Accounts Payable for the amount and debit the General Ledger real estate account, which increases an asset and also increases a liability in the same way we treat any additional equipment acquired.

At the end of each month we foot the columns on Exhibit E. If more than one page is required, the totals are carried forward from page to page. The total debits must equal the total credits. The journal columns then should be posted to the general ledger; that is, the amount in the Accounts Payable column should be posted to the credit side of the Accounts Payable Account in the General Ledger and the cement, sand and gravel, miscellaneous material, pay roll, manufacturing expense, delivery expense, selling expense and administrative and financial expense columns should be posted to the debit side of their respective accounts in the General Ledger. The footings of the general ledger accounts are not posted, for each item that is placed in this column is posted from day to day in the general ledger. The expense accounts are posted daily to the expense ledger, such as is illustrated in the account column in Exhibit E.

We believe that if the form is carefully studied, together with the elementary article on bookkeeping that appeared earlier, the reader will encounter little difficulty in understanding the Accounts Payable and Disbursement record.

Organizations

American Concrete Institute; Harvey Whipple, Secretary, 2970 West Grand Blvd., Detroit, Michigan.

Twenty-fifth annual convention, Book-Cadillac hotel, Detroit, Mich., Feb. 12th to 14th.

American Concrete Pipe Association; M. W. Loving, Secretary, 33 W. Grand Ave., Chicago.

Twenty-second annual convention, Book-Cadillac Hotel, Detroit, Mich.. Feb. 14th to 16th.

American Construction Council; Dwight L. Hoopingarner, Executive, 28 W. 44th St., New York City.

American Engineering Standards Committee; Dr. P. G. Agnew, Secretary, 29 W. Thirty-ninth St., New York City.

American Road Builders' Association; Miss E. A. Birchland, Secretary, 29 W. Thirty-ninth St., New York City.

American Society of Civil Engineers; Geo. T. Seabury, Secretary, 33 W. Thirty-ninth St., New York City.

American Society for Testing Materials; C. L. Warwick, Secretary-Treasurer, Engineers' Club Building, 1315 Spruce St., Philadelphia, Pa.

Associated General Contractors of America; D. H. Sawyer, Secretary, 1150 Munsey Bldg., Washington, D. C.

Association of Cast Stone Manufacturers; Frank M. Brooks, Secretary, Pasadena, Calif.

Building Officials Conference of America; Col. John W. Oehmann, Secretary, 1253 Lawrence St., N. E., Washington, D. C.

Concrete Products Association; F. O. Matthiessen, Secretary, 644 Drexel Building, Philadelphia, Pa.

Annual convention, Book-Cadillac Hotel, Detroit, Mich., Feb. 13th.

Concrete Reinforcing Steel Institute; M. A. Beeman, Secretary, Tribune Tower, Chicago.

Iowa Concrete Products Association; R. L. Gavin, Secretary-Treasurer, 1002 Hubbell Bldg., Des Moines, Iowa.

National Association of Builders' Exchanges; Earl F. Stokes, Secretary, 15 E. Fayette St., Baltimore, Md.

National Crushed Stone Association; J. R. Boyd, Secretary, 751 Earle Building, Washington, D. C.

National Fire Protection Association; Franklin H. Wentworth, Secretary, 40 Central St., Boston, Mass.

The National Lime Association, Norman G. Hough, Secretary and Manager, 927 Fifteenth St., N.W., Washington, D. C.

National Sand and Gravel Association; V. P. Ahearn, Executive Secretary, 432 Munsey Building, Washington, D. C.

National Slag Association; H. J. Love, Secretary-Treasurer, 937 Leader Building, Cleveland, Ohio.

Northwest Concrete Products Association; F. R. Zaugg, Executive Secretary, 803 Seaboard Building, Seattle, Wash.

Ohio Concrete Products Association; G. M. Friel, Secretary-Treasurer, 2284 North High St., Columbus, Ohio.

Portland Cement Association; William M. Kinney, General Manager, 33 W. Grand Ave., Chicago.

Rail Steel Bar Association; H. P. Bigler, Engineering Secretary, Builders' Building, 228 N. La Salle St., Chicago, Ill.

Wisconsin Concrete Products Association; Jack Franklin, Secretary-Treasurer, 3115 Plankinton Arcade, Milwaukee, Wisconsin.

Mixer Musings

Reported by "Joe"—The Mixer Boss.

Epidemics and Epidemics

The "flu" epidemic has passed, but it seems as if a new epidemic is breaking out, especially among concretors. Joe, the Mixer Boss, has been deluged of late with "poetry" —some real poetry, some near poetry, and some darn far from being poetry. At any rate, here's a sample:

THE LAY OF AN OLD MIXER

(With apologies to the shade of Scott)

The lot was large, the wind was cold,
The mixer was rusty and old;
Its wobbly wheels and chassis grey,
Seemed to have known a better day;
The motor its sole remaining joy,
Had been tended by an Italian boy.
Once called by some "the contractor's pet,"
It had turned "it" out good and wet.
Ah, welladay, its time has fled,
Its other brethren are also dead.
No more on a new contract borne,
To mix and mix from dawn to dawn;
It poured for boss some time away,
The last mix of a perfect day.
Old times are changed, old manners gone,
A stranger fills the mixer's throne.
The bigots of this new time
Had called its wet mixes a crime;
A useless mixer scorned and poor,
It would ne'er mix concrete any more.
Oft complaining and breaking down,
Sometimes "in transit" in the town,
But on the whole, doing its work,
With sometimes a shutdown, due to shirk.
But it wasn't because of such as this
That the mixer had been set amiss
To lay and rust the winter through,
The spring, the summer, the autumn, too,
But because of Duff's high decree
That water was a certainty
To spoil a mix if too great
A proportion used by weight
To cubic content of cement,
Howsoever designed or meant.
"If the mix is good and wet,"
Said he, "it is the safest bet,
The mix would be under par."
That's why the mixer is behind the bar,
'Las with its hatches almost dry
Try as it would, it couldn't on high,
Get it out of the drum, ah me,
That was the end of chivalry.
It was pounded and beaten and dented in
But it couldn't do a single thing
To empty the drum of the sticky stuff.
After a week the boss cried, "Enough!
We must get a mixer so designed
That will live up to Duff—so refined."
And that is why the mixer's at rest
Due to Duff's cement ratio test.
This is the song of a mixer old,
Its day is done and its tale all told.

—J. Sayers Lain.

New Equipment and Materials

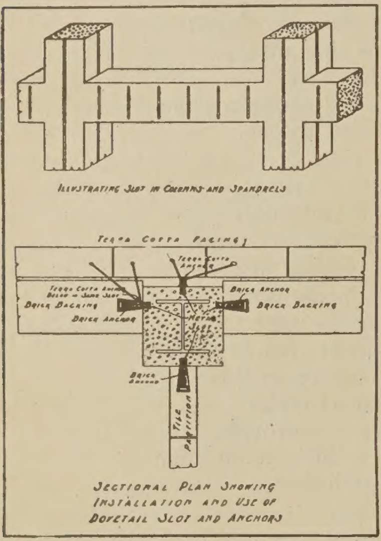
Clamshell Bucket Featuring Digging Power

A clamshell designed for great digging power has been announced by the Lakewood Engineering Company, Cleveland, Ohio, for use in all kinds of digging and excavating work, including deep water dredging, as well as rehandling.

Two of its features are the extent of the open reach of the jaws and the concentration of closing power near the end of the stroke so that the shells are forced to stay down in the material until they are fully closed.

Dovetail Masonry Anchor is Simple

Dovetail masonry anchor is a galvanized metal slot nailed to the inside face of exterior forms, the nails being driven through the back of slots into form lumber. The manufacturer points out their simplicity, with no need for accurate measuring.



Illustrating Slot in Columns and Spandrels

Sectional Plan Showing Installation and Use of Dovetail Slot and Anchors

These anchors are a product of the Dovetail Anchor Slot Company, Chicago, Illinois.

Hunt Process Curing Coat Permanent

The Hunt process of curing concrete is based on the theory that there is sufficient moisture in newly poured concrete to effect a perfect cure, provided moisture can be kept from evaporating. By this patented process, evaporation is prevented by the application of a coating of "McEverlast paving special" with a spray gun immediately after the concrete has been poured and belted.

This method of curing, the manufacturer states, permits the use of the street or highway by pedestrians within two days after the concrete is laid; by light automobile use within seven days, and heavy traffic within twelve days.

The need for other means of curing is said to be totally eliminated by this process. The substance becomes an integral part of the concrete, after 30 days changing in color from jet black to a granite-like finish and effectively killing glare, the manufacturer states.

Its use is also suggested for the curing of pipe, bridges, walls, beams and floors.

The Everlasting Paint and Sales Company are the owners of the Hunt process and are located at Los Angeles, Calif.

Use Standard Autocar Chassis for Concrete Carrier

After a series of tests of machinery for transporting ready-mixed cement for road building and contracting work at the plant, the engineers of the *Autocar Company*, Ardmore, Pa., have adopted for use on the standard Autocar chassis, the Good Roads-Clinton Concrete carrier, manufactured by the Good Roads Machinery Company, Inc., of Kennett Square, Pa. The principal features of the carrier are its simplicity and its strength.

It consists of a cylindrical steel tank of 1½ or 3 cu. yds. capacity. The inside walls and ends are perfectly smooth and entirely free of flights, supporting shafts or obstructions of any kind.

After loading the carrier, it is hermetically sealed and slowly revolves until ready to discharge. The rolling action is designed to eliminate all segregation and to cause most complete hydration. The batch may be put on the job as long as three hours after loading at the central plant and it will have the exact consistency it had when discharged at the mixer, the manufacturer states.

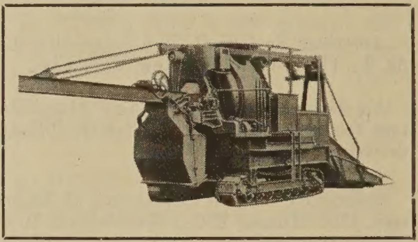
The carrier is powered by a motive unit entirely separate from the power plant of the truck. An 8-h.p. Le-Roi 2-cylinder motor, with throttle control, is mounted on the chassis to furnish the power for the revolving motion of the carrier.

Efficient Spreader Tie

The Nelson Spreader Tie is said to combine the functions of spreader and tie in wall form building. It eliminates the use of spreaders, cutting to length, nailing in and fishing out and does away with all boring of forms, all cutting, placing and twisting of wire according to the manufacturers. Moreover, one-half turn of the tie with a claw hammer cuts it off flush with the wall. Distribution is handled by the Fischer & Hayes Rope & Steel Company of Chicago and their agents in forty large cities.

Paver, Shovel and Mixer at Koehring Exhibit

Heavy duty construction and ability to produce concrete meeting scientific standards are the two prime features of the new Koehring 27-E paver, exhibited for the first time at the Cleveland road show by the Koehring Company, Milwaukee, Wisconsin.



In addition to the paver, Koehring also showed its 501 shovel with 1¼-yd. dipper and 16 ft. dipper sticks, and equipped with power dipper trip. The 10-S Dandie completed the exhibit.

Improvements on Heltzel Bins and Measuring Devices

The Heltzel Steel Form & Iron Company of Warren, Ohio, have made numerous improvements in their steel bins, weighing and volume Agrabatchers during the past year.

On their all-steel bins of 35 to 55 ton capacity, the reinforcing members have been improved to add still further rigidity. The slope of the hopper plates has been increased to 50 degree slope, to insure ready flow of materials. The 55 ton bin is flanged on four sides.

The Heltzel duplex weighing Agrabatcher has been newly developed. This Agrabatcher is rectangular in form, with hopper bottom in two compartments, and amply large to hold the quantities of material necessary for the ordinary batch used in road and other types of construction work. The capacity of the stone compartment is 3000 lb., or approximately 31 cu. ft., and the sand compartment has a capacity of 2000 lb., or approximately 20 cu. ft.

The Heltzel duplex Agrabatcher is equipped with an American Kron Automatic Springless Dial Scale, having a 36 ft. dial graduated to 5000 lb. by 5 lb. graduations.

About Makers of Equipment and Materials

NEW EQUIPMENT
(Continued)

The Blaw-Knox Agitator Truck Body

The Blaw-Knox Company of Pittsburgh have added to their line the Agitator truck body, invented by the Graham Brothers, contractors and ready mixed concrete dealers of Richmond, Virginia, for the transportation of mixed concrete from the mixing plant to the job.

The method of agitation is such as to prevent any segregation for any mix, whether dry or wet, according to the manufacturer. The agitating mechanism not only stirs in the circular cross section of the body, but keeps the concrete in constant circulation along the length of the body, it is said.

New Prest-O-Lite Floodlight Attachment

The Prest-O-Lite Co., Inc., New York City, is producing a flood light attachment of new design for use with the small tanks of dissolved acetylene, similar to those used for trucks and tractor lighting.

The improved attachment is said to be of simple, strong, rigid and compact construction. Universal adjustment is obtained with only one swing joint, thus minimizing the possibility of leakage.

Because of the substantial construction of the new part and because of its position near the center line of the tank, the attachment itself can be used as a handle in carrying the entire unit.

Roller Bearings

The last paragraph of an item on page 51 of the December issue, describing the new skip hoist winding machine of the R. H. Beaumont Company should have said that the equipment "employs the highest grade roller bearings" instead of "rubber," as it was given.

Avril Tru-Batch Body

The illustration which appeared in the January issue on the page entitled "At the Road Show" in an item describing the "Tru-Batch Body for Hauling Mixed Concrete" was that of another manufacturer and should not have appeared where it did.

The Tru-Batch body is manufactured by the Avril Tru-Batch Concrete Company, Cincinnati, Ohio, in collaboration with the LeBlond-Schacht Truck Company.

NOTES FROM THE FIELD

American Cement Machine Purchase

The American Cement Machine Company, of Keokuk, Iowa, manufacturers of "Boss" cement mixers, pavers and hoists, announce the purchase of the *Inland Construction Equipment Corporation* of that city, manufacturers of "Mandt" automatic dump bodies. Production plans have been made and in a short time a complete line of automatic dump bodies for practically all makes of trucks and automobiles will be announced. The American Company has also announced a new direct-to-consumer selling policy, on all Boss mixers, pavers and hoists, beginning with the new year.

Fuller & Johnson Reorganized

Control of the *Fuller & Johnson Mfg. Co.*, of Madison, Wisconsin, has been purchased by the *Second Ward Securities Co.* and the *Quarles Co.*, of Milwaukee, according to a recent announcement.

The company has been reorganized, additional capital has been supplied and ownership is in a group affiliated with the investment houses mentioned and with the management of the company.

Service Building Dedicated

The new service building of the *Yale & Towne Mfg. Co.*, of Stamford, Conn., was formally dedicated on November 26th.

The structure is modern in construction and up to date in heating, lighting and ventilation facilities, and will admirably serve as a recreational center for the thousands of employees of the company.

Orelite Officers

The *Orelite Company, Inc.*, New York City, which is producing a natural and calcined diatomaceous earth for insulation purposes, has elected new officers, as follows: S. Janovici, president and treasurer; J. Gilbert Mason, Jr., vice-president and secretary; A. Janovici, assistant secretary, and M. J. Kaufman, assistant treasurer.

Testing Engineer

Martin A. Morrissey, Ch. E., has been appointed in charge of the Boston laboratory of the *Thompson & Lichtner Company*, Boston, Mass. Mr. Morrissey is formerly of the Massachusetts State Highway Testing Materials Laboratory.

The company announces also that the Boston laboratory has been completely rearranged and equipped in order to expedite the making of tests.

To Sell Truck Bodies

L. S. Shaffer has joined the organization of the *C. O. Bartlett & Snow Co.*, of Cleveland. Mr. Shaffer was formerly general manager of Byers Machine Co., Ravenna. He will be in charge of the sales and development of the truck body Bartlett-Snow are building for the transport of pre-mixed concrete.

The sale of this body will be handled outside of the regular Bartlett-Snow sales organization, the present plan being to distribute this product entirely through dealers in contractors' equipment and through manufacturers of motor trucks.

United States Gypsum Company Enters Metal Lath Field

Metal lath of all types and metal lath accessories have been added to the line of commodities distributed by the *United States Gypsum Company*, according to an announcement from the company headquarters at Chicago. The company's Red Top brand will be used on all metal lath products.

In charge of metal lath sales for the company is *H. B. Spackman*, formerly with the Northwestern Expanded Metal Company, and more recently with the Milwaukee Corrugating Company. Mr. Spackman will headquarter at the company's general offices in Chicago.

New Mill for Production of Facings

A new feldspar mill has recently been placed in production by the *United States Feldspar Corporation* at Cranberry Creek, Fulton County, New York. One of the byproducts of this mill is pink-colored *Biospar* crystals. A lustrous black crystal is also offered. The feldspar of Fulton County district, New York, are famous for their fine color and Biospar crystals will bear out this statement as they will never fade, according to the producers.

C. H. Peddrick, Jr., is president and general manager and H. M. DeLanoie is secretary and treasurer.

Ryerson Takes on Tool Line

Joseph T. Ryerson & Son, Inc., have taken on the Millers Falls line of portable electric tools.

Penn-Dixie Sales Manager

The *Pennsylvania-Dixie Cement Corporation*, New York City, has appointed *Walter S. Wing* general sales manager. His headquarters are at New York City.

About Makers of Equipment and Materials

INDUSTRIAL LITERATURE

On Presteel Pallets

One of the publications of the *Commercial Shearing and Stamping Company,* Youngstown, Ohio, is a 20-page booklet on its Commercial Presteel pallets. The type of pallet for each kind of product is diagrammed, cataloged and the machines with which it is used named. Self-racking pallets, rolled corner brick, and special pallets are also covered.

Other products plant equipment described are curing racks and trestle ends, drying racks, and material bins.

"Dreadnaught Clamshell Buckets"

"Dreadnaught Clamshell Buckets" is the title of an elaborate catalog of all equipment of this type produced by the *Blaw-Knox Company,* Pittsburgh, Pa. It is numbered as Form 1059.

Limiting detail to a great extent, the publication goes directly to the point of the numerous features of construction. Included among other things are suggestions to help in the selection of a bucket. Some space is also devoted to buckets for road building work. Other types are grouped in their respective divisions.

Screen Publication

High operating efficiency is the theme of a 48-page bulletin entitled *"Saving and Making Money with Rol-Man Screen,"* issued by the *Manganese Steel Forge Company,* Philadelphia, Pa.

In addition to complete information on the application of the screens to revolving, vibrating, shaking, and inclined-gravity equipment, endorsements of Rol-Man screens by operators of various plants are reproduced.

Description of Curcrete Process

The Barber Asphalt Company, Philadelphia, Pa., has just completed the publication of a booklet describing the Curcrete process for curing concrete. The booklet contains, in addition to specifications and directions, a description of Curcrete and the method of applying it.

Data on comparative tests of various methods of curing, including Curcrete, are also presented.

New Book on Master Paver

"What to Look for When Buying a Paver" is the keynote of a fully illustrated 36-page book *"The Master Paver"* recently published by the *Ransome Concrete Machinery Co.,* Dunellen, N. J.

A complete description is given of parts. Graphic photographs show details of the important parts of the Master Paver. Several illustrations of the paver in operation on important jobs in different sections of the country, with the names of the owners, are featured.

A brief section is also devoted to Central Mixing Plants.

Form Tie Publication

Illustrations comprise the bulk of the material contained in a 12-page booklet on the *Ezy-set* form tie. Line drawings show the product and its use in various types of erection.

The advantages of the tie are summed up by the manufacturer in this publication as the following: Only about 25 per cent of the customary nailing is necessary; form material may be reused, because of very little breakage in wrecking, and the finished job is free from all protruding ends, the ties breaking over ¼ in. inside the surface of the wall.

The tie and the booklet are products of the *Ezy-set Wall Tie Co.,* Dayton, Ohio.

Motor Literature

Wagner Electric Corporation, St. Louis, Mo., has issued a new bulletin, No. 158, on small vertical motors, covering all types, in ratings of ⅛ to 1½ hp. As illustrated by diagrams in this bulletin a feature of these motors is that they all have the same flange or lug dimensions, making it possible for manufacturers and users of small motor-driven machinery to interchange motors of different types and rating on the same mounting dimension.

Another feature is the Wagner "labyrinth seal" to prevent the leakage of lubricant into the motor windings, and effecting, according to the manufacturer, a dust-proof, leak-proof bearing housing.

On Inserts

The cost cutting features and wide utility range of "Tie-to" inserts are presented in some detail in a four-page leaflet just off the press and received from the *"Tie-to" Insert Co.,* Milwaukee, Wis.

One man, it is stated, can place 500 lin. ft. of hangers in an hour, providing a continuous hanger that allows the lath to be tied at the rib no matter how the lath rib is spaced. Its uses as a veneer anchor include the tying of brick to concrete walls, columns or spandrels, and as a hanger for stucco plastering.

Fuller-Kinyon System

Printed information is now available, in the form of a small bulletin, on the *Fuller-Kinyon* system for handling bulk cement at ready mixed concrete and concrete products plants. The bulletin describes the process in detail, and illustrates it with photographs and drawings.

The cement to be conveyed is delivered to the hopper of the Fuller-Kinyon pump and is advanced through and compacted in the pump barrel by a rapidly rotating impeller screw. A small volume of compressed air is admitted beyond the screw to create a fluent mixture of air and cement. The cement is delivered to the storage and mixer bins through branch lines controlled by two or three-way diverting valves depending upon the number and location of the receiving bins.

The Fuller Company, Catasauqua, Pa., is the manufacturer of Fuller-Kinyon conveying systems.

Admixture Broadside

"It costs less to prevent segregation than to cover it up" is the theme of a colorful broadside to further the use of *Celite* admixture and published by the *Celite Products Company.*

Attention is called to the lack of patching necessary on the 150,000 sq. ft. of exposed concrete on the cold storage building illustrated. Strengths were reported good and clean sharp sand and washed limestone were used as aggregates on this job, the concrete being placed at a 1½ in. slump, according to this circular. The entire job of 6,500 cu. yds. of concrete, it continues, was placed in 12½ working days.

Lift Truck Broadside

The annual edition of *"Jacklift and Stacker Practice,"* issued by the *Lewis-Shepard Company,* Boston, Mass., is received. This is a broadside showing in particular Lewis-Shepard special purpose stackers. Standard equipment and special purpose lift trucks are also illustrated and briefly described.

New Celite Publication

The *Celite Products Company* has just published an 8-page pictorial bulletin *No.* 340 entitled *"Quality Concrete,"* and giving a concise story on workability and methods by which the relative degree of workability of concrete mixes may be measured.

The effect of workability on strength, uniformity, watertightness, and appearance is also discussed.